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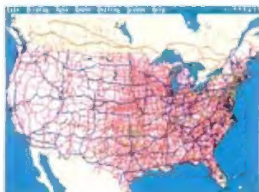
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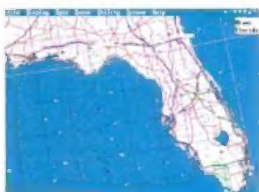
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Inside

Question: What is a mainframe?
Answer: The biggest PC peripheral you can buy.

If *PC Magazine* is guilty of promoting a PC-centric vision of the universe, it's because the products we look at are so flexible and inexpensive compared with their predecessors.

This issue's feature story on LAN-based accounting software is the third chapter in a story about downsizing that *PC Magazine* and our colleagues at Price Waterhouse have been telling for two years.

Our master storyteller is Price Waterhouse consultant Raymond August, a man who spends a great deal of his time convincing clients that accounting, the quintessential mainframe and mini application, is up to speed on the PC platform.

The first time we evaluated multi-user accounting software ("The Price Waterhouse Report," September 26, 1989), it was August who supervised the design of our performance tests.

The tests generated mainframe-level transaction processing that should have choked any LAN, but in the end, most of the software was up to the challenge. We suggested that our readers look into bringing their organizations' accounting down from a mainframe or mini to a LAN that would be much cheaper to maintain.

Last year, we speed-tested several



LANs ("Can LANs Beat Minis?," May 29, 1990). Using accounting as our benchmark test application, we proved that there were several configurations, most notably a Compaq Systempro server running Unix, that could outrun a minicomputer costing twice as much.

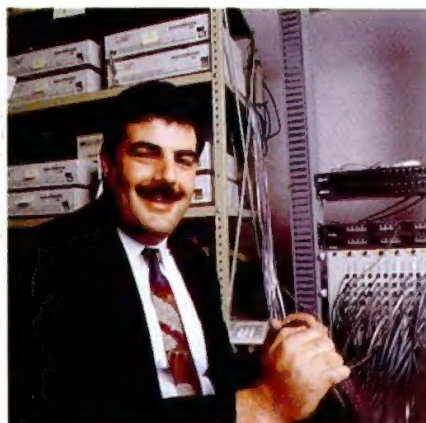
This year, we revisit high-end accounting and find that while some programs have improved only slightly in the past two years, others have taken some great technological leaps forward:

And they're going to get better. August says, "This may be the last time we can use these tests. Next time around, a majority of products will be graphical, and many will be client/server-oriented. Those products won't be competing with minis

and mainframes, they'll be tapping into them for processing and storage." The biggest peripheral.

August enjoys all the hard work that a *PC Magazine* evaluation entails, but he has quite a reputation for complicating our accounting stories. Last year, his wife, Cathy, gave birth to their first daughter, Samantha, just three days before our LAN speed testing began.

This year, August's second daughter arrived on his article deadline day. We suggested, for the second time, that the proud parents name the baby Lana, but they ignored us once again. Victoria is doing fine.—Don Willmott ■

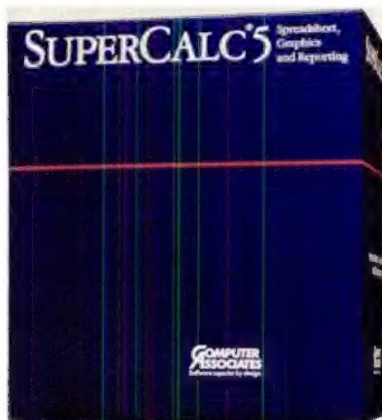


Price Waterhouse consultant Raymond August is the person we turn to when it's time to test the capabilities of accounting software.

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PHOTOGRAPHY: THOM O'CONNOR

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What The Experts Think.

Recently, *VARBUSINESS* conducted a survey of some people who know more about spreadsheets than anyone.

The people who sell, install, and support them for a living. The survey asked hundreds of spreadsheet dealers and resellers all kinds of questions about the top-rated spreadsheets. They were trying to find out what the experts rate as the best spreadsheet. And the experts told them.



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Graphical computing is the way the world is going. The editorials agree. The industry pundits agree. Even our competitors' ads agree.

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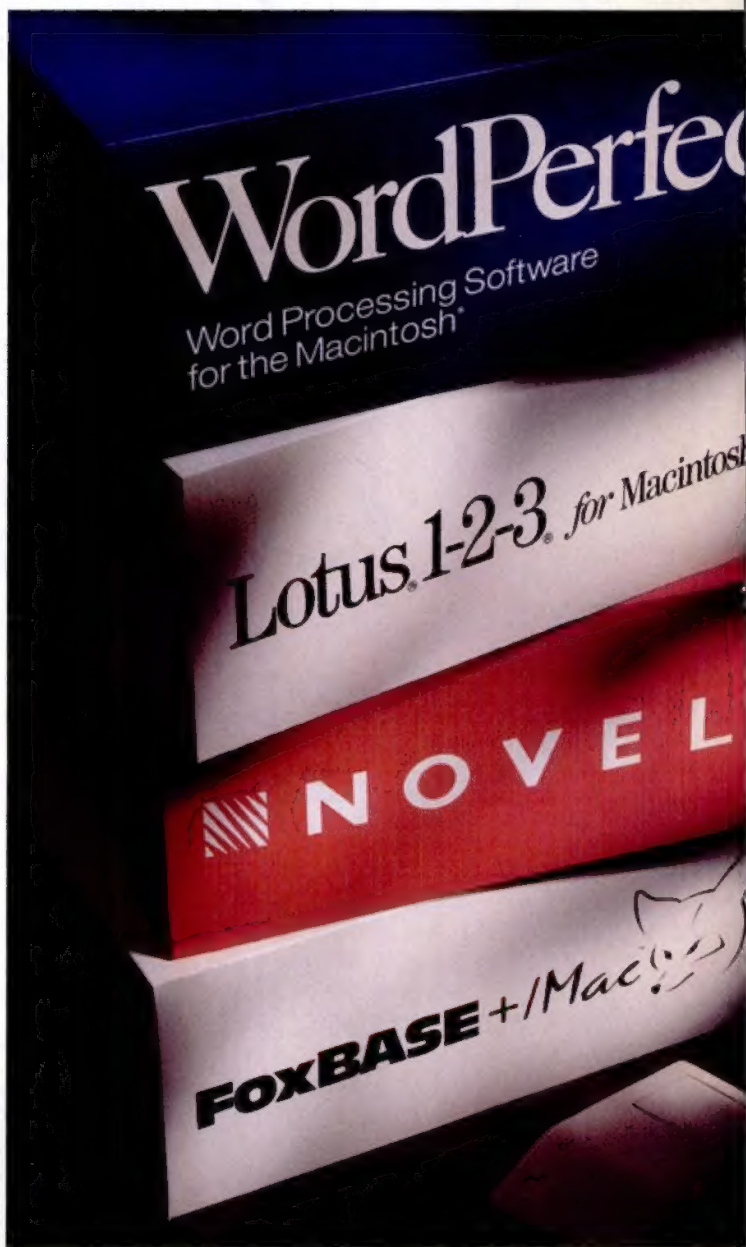
And now, with new Macintosh versions of some of the most popular DOS programs, you can have all the benefits of a Macintosh without sacrificing any of your investment in MS-DOS PCs, applications and data.

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For more information about Lotus 1-2-3, call 800-TRADEUP, ext. 6007. About FoxBASE+/Mac, call 800-837-FOX2. About WordPerfect, call

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DOS computer Macintosh.



right into the program. Which means graphic images, charts and sidebars can be added and edited without any reformatting hassles.

There's also the powerful new FoxBASE+/Mac, which is up to 10 times faster than most other database packages. It takes full advantage of the graphic, intuitive Macintosh way of working, and allows Macintosh and DOS users to access the same data simultaneously. And it can read dBASE files, too.

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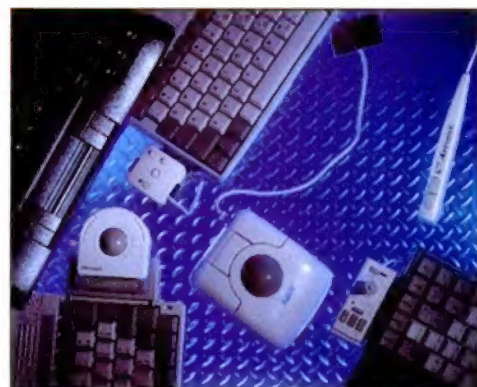
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WINSTATION
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Microprocessor: 386/SX running at 16MHz
Special Features: Press report with Microsoft Word v. 3.1 MS EXCEL v. 1.0 Mail Merge
Storage: 40Mb 1 Floppy Drive 1 4400 1 2Mb FDD
Memory: 2Mb RAM
Video: 14" Non-graphics 1024 x 768 VGA Color Monitor with 1Mb VRAM Color video Adapter



AUSTIN 386/SX20
WINSTATION
\$1890

Microprocessor: 80486 SX running at 20MHz
Special Features: built-in soft Modem, Parallel ATA, LAN (optional), SCSI, CD-ROM
Storage: 4 MB of fast DRAM, 40 or 1 MB of hard disk
Memory: 4 MB RAM
Video: 14 Nch channels, 1024 x 768 pixels, 60 Hz
Monitor optional 1 Mbit VGA Color, Super Adapter



AUSTIN 386/25
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Memory: 1MB RAM
Video: VGA, EGA Display
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32 Gray Scale
Keyboard: Full size embedded numeric pad w/ 12 function keys



**AUSTIN 386/33
WINSTATION
\$2690**

Microprocessor: 386 running at 33MHz, 64K System Cache
Special Features: Pre-installed with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 1.25Mb IDE Hard Drive, 1.44 or 1.2Mb FDD
Memory: 4Mb RAM
Video: 14" Non-Interlaced 1024 x 768 VGA Color Monitor with 1 Mb VGA Color Video Adaptor



**AUSTIN 486/SX20 15A
WINSTATION
\$2790**

Microprocessor: 486/SX running at 20MHz
Special Features: Preinstalled with Microsoft Windows 3.0, MS DOS and a Microsoft Mouse
Storage: 1.25Mb IDE Hard Drive, 1.44 or 1.2Mb FDD
Memory: 4Mb RAM
Video: 14" VGA Monochrome monitor with 16-bit VGA Video Adaptor



**AUSTIN 486/33 ISA
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Microprocessor: 486+ running at 33MHz
Special Features: Pre-installed with Microsoft Windows 3.0, MS DOS and a Microsoft Mouse
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Video: 14" VGA Monitor (optional) monitor with 16-bit VGA video Adaptor



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CIRCLE 304 ON READER SERVICE CARD

Letters

THE DOS 5.0 DEBATE BEGINS

With all the fine press about MS-DOS 5.0, I was one of the first on line to buy it. After all, it promised much more memory, and that's really why most of us are upgrading. Then the inevitable. True, it saves memory over DOS 4.0 and can provide up to 620K if it is loaded in high memory on a 386, but for the vast majority, it translates into a minimum 5K loss.

And then the clincher. It doesn't run *DESQview*! What a surprise! Here we have a new operating system from the *Windows* people and it won't coexist with their only real multitasking competition. Every other software manufacturer except Quarterdeck Office Systems is given space with help in README files.

This DOS turkey is being exchanged tomorrow for DR DOS 5.0, which will live in the same house as *DESQview*.

Ernie Leute

Marlboro, New Jersey

I've eagerly awaited the release of DOS 5.0, and now that it's here, I am disappointed. An operating system upgrade should include, among other things, more available memory, utility functions not already commonly available, and a graphical interface.

MS-DOS has probably avoided the big thud of 4.0, but it offers too little and comes too late.

Robert W. Rue

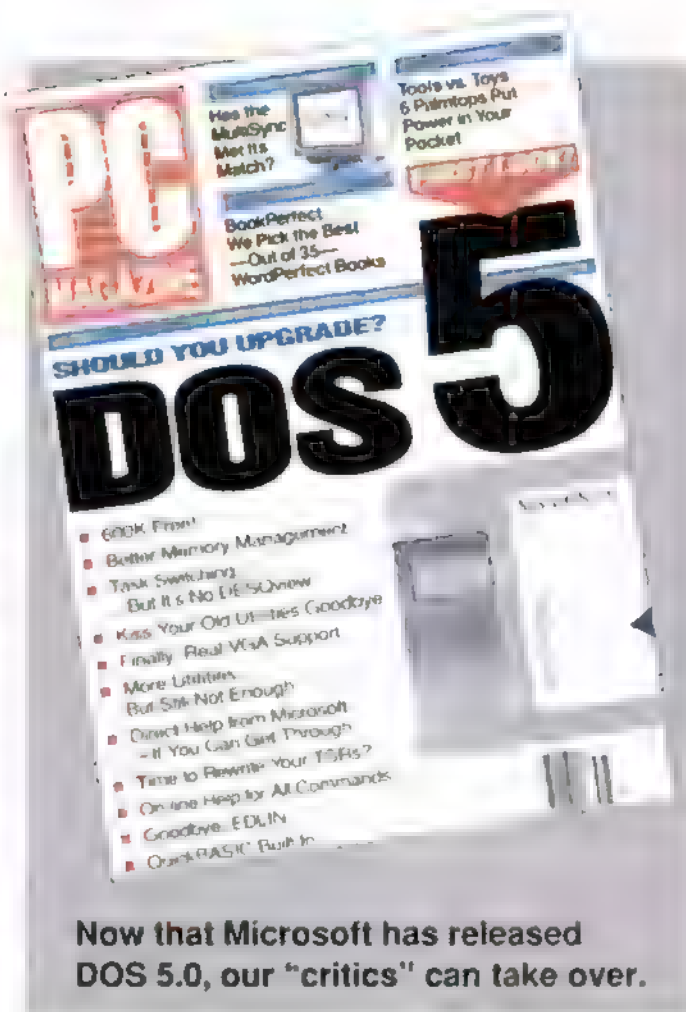
Eaton, Illinois

The new DOS 5.0 is vastly overblown. Except for the ability to load a part of the DOS kernel into HMA, all the features of the new DOS have been available in third-party software for some time.

Loading programs high into UMBs and HMA is no real solution to RAM cram. Software writers should concentrate on writing programs that make more use of expanded RAM and disk overlays, instead of worrying about cutesy interfaces.

Frederick S. Holmes, Jr.

Annandale, Virginia



Newspaper accounts heralding DOS 5.0 stated that Microsoft tested this version with 7,000 users. They must have meant 70; how else do you explain that one out of four BASIC example programs crashes on a fast 386, and DOS commands that do not give HELP with the /? option.

DOS 5.0 is a significant step forward and worth the change; the extra memory and DOSKEY are delights. However, I continue to feel that Microsoft does not adequately test its products nor listen to the general public.

Lawrence A. Ehrhart

Chicago, Illinois

THE OS/2 FAN CLUB

What happened? *PC Magazine* used to be the source for getting the most out of a computer. Recently, the talents of two brilliant writers, Charles Petzold and Ray Duncan, have been wasted on *Windows* instead of an innovative OS like OS/2 2.0. Sure, *Windows* has outsold OS/2, but Nintendo has outsold them both. Will they review video games for PCs next?

Alan Gorski

Dockton, Washington

Here are some of the common myths about IBM's OS/2:

It won't run on clones. Wrong! I run IBM OS/2 1.3 on my 386SX clone.

OS/2 requires more hardware than Windows. Wrong! If you can run *Windows* on your present configuration, you can run OS/2. In fact, OS/2 runs faster than *Windows* on a 6-MHz IBM AT. Test it.

Most DOS applications won't run in the OS/2 compatibility box. Wrong! I have tested over 130 DOS applications in the DOS box and have found only one that would not run (IBM's tape backup software PS2TAPE 1.11).

Present the facts and provide the useful, helpful information that your readers expect. Why not give OS/2 a fair shake and let your readers decide what they want to use?

Anthony J. Oresteen

Batavia, Illinois

OS/2 has a unique political asset that is being ignored in recent discussions in the computer press. OS/2 is shaping up as the only viable non-Microsoft OS for Intel microprocessors. As long as Microsoft controls MS-DOS and writes applications for it, all other application developers will be at a competitive disadvantage.

OS/2 is crucial in the long term to the major market leaders. Nobody but IBM can deliver and market an operating system to compete with Microsoft.

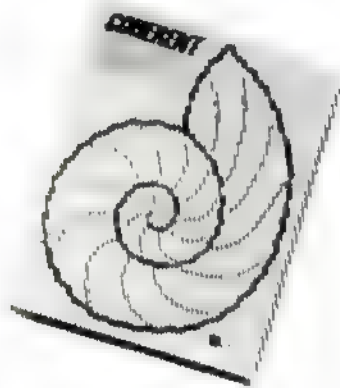
Brian B. Mulholland

Port Jefferson Station, New York

Your title "Is OS/2 Destined to Be Nothing More than the QEMM-Killer of 1992?" (*Pipeline*, June 25, 1991) amply demonstrated that your editorial bias against OS/2 has reached ridiculous proportions. Once users learn that OS/2 2.0 provides a much more reliable platform than *Windows*, they will realize that OS/2 2.0 is really a better DOS than DOS and a better *Windows* than *Windows*.

Already, Price Waterhouse has stopped all purchases of *Windows* and plans to

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—Sean Fulton, UNIX Today!

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Letters

purchase 5,000 to 10,000 copies of OS/2 2.0. Many other corporate and individual users will be reaching the same conclusions over the next 6 to 12 months.

Robert E. Brown
Sunnyvale, California

PALMTOP POTENTIAL

Jonathan Matzkin's review of palmtops ("Palmtop PCs: Power By the Ounce," July 1991) missed what can be considered a potentially valuable use for these computers—their ability to generate data for immediate use by other systems.

In 1987, the Wyoming Cooperative Agricultural Pest Survey began evaluating palmtops and laptops for use in the field, in hopes of alleviating an increasing manual data entry workload, decreasing data entry errors, and improving the timeliness and availability of pest survey data.

We now use 18 Tandy 102s in the field; scouts record information on the Tandys and then transmit the data to the office desktop PC. Reports and maps are produced from the field data as soon as it is received. This is great, but the Tandys take up too much space. It would be ideal if manufacturers would include a programming language with the DOS software and a strong telecommunications package—all on a palmtop.

JoDee Hutchason
Wyoming CAPS Coordinator
Laramie, Wyoming



The vertical application that Hutchason describes is indeed a natural for palmtops. Such uses, however, are outside the scope of broad-based applications that we feel are of interest to the majority of our readership. The point, though, that none of the currently available palmtops has all of the hardware and software features that users need, is extremely well taken.

—Jonathan Matzkin

IT'S SUPER NOTEBOOK!

I recently purchased a new Tandon 386 notebook. I had had the computer only 48 hours, when, after working very hard one day and feeling a little brain dead, I got into my car to go home, but left my notebook on the roof of the car!

I was going about 30 mph and of course the computer fell off. I was about halfway

home before I realized what had happened.

I put an ad in the paper, offered a small reward, and unbelievably, someone returned my notebook! And even more unbelievable was that it was in one piece, with only some minor external damage.

I sent the computer back to be checked out; four days later it was fixed: They updated my BIOS and replaced the screen *at no charge!* It is refreshing to find a company that is not only fair, but goes above and beyond the call of duty.

Patrick F. Herlihy
Fort Edward, New York

MANGERS ARE IMPORTANT, TOO

In response to Stephen H. Maxwell's letter (Letters, May 14, 1991), agriculture, too, has gone computer. He was upset be-

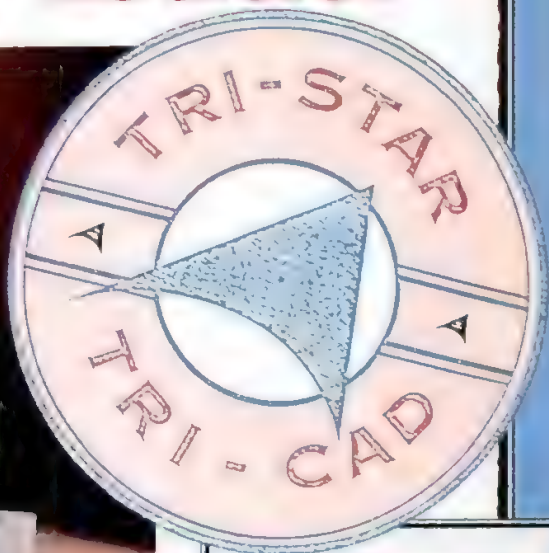
**OS/2 has a unique
political asset that
is being ignored by
the computer press:
It's the only
viable non-Microsoft
OS for Intel
microprocessors.**

cause his spell-checker had okayed *manger* when he meant *manager*. He suggested that agriculture-related words be deleted from spell-checkers.

Although farmers and ranchers may total only 3 percent of the population, we are feeding the rest of you.

Betty Russell
Howard, Kansas

Apropos Mr. Maxwell's megalexiconophobia: The *WordPerfect* SPELL.EXE utility enables excision of *fro*, *manger*, and any other disruptive critter that might mosey along. Words can be added to or deleted from the main dictionary in groups from files or the document screen. Compilation of a cumulative disk file and periodic use of this method could be the best bet for those chronically beset with mavericks, because



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patibility, offers high resolution full-page drivers for Windows 3.0, WordPerfect, Lotus 1-2-3, AutoCAD and others, displays up to 32,768 colors and meets the Swedish standards for low ELF/VLF magnetic emissions. We might also mention that MultiView—the fastest SVGA card you can buy today—works with a variety of multi-frequency displays, sells for \$449 and comes with a seven-year



warranty. ● If the combination of Full Page Pivot and SVGA MultiView sounds like the perfect display system for all your applications, it's probably because it is. Pivot and MultiView are available from Radius, the leading manufacturer of high resolution graphics systems for personal computers. To find your nearby Radius reseller or to receive a Full Page Pivot video tape, call 1-800-227-2795.



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And they weren't just any guys, either.

They were a group of editors from *PC Magazine*, and in their February 26th, 1991 issue, they had some

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DCA



Letters

the process can take quite a while.

By the way, *manger* is not exclusively relevant to the livestock industry. Large numbers of people rush to and fro, thanks to an institution known as Christmas.

Jordan V. Hodgson
Torrance, California

MAILING-LIST MANAGEMENT

I fear for the professionals who advise their respective companies to go out and jump into the discount-mail foray because of your article about Arc Tangent's Mailing List Management Tools (Software, June 25, 1991).

Regardless of what
the experts say, it is
the end user who
ultimately determines a
product's viability.

Managers who want to take advantage of postal discounts would be well advised to determine what their mailing needs are first, make sure their typical mailpieces are able to be automated, and investigate the feasibility of performing mail services in-house versus using a service bureau.

Some will find that the time, cost, and expertise necessary make it worth contracting with mailhouses and service bureaus, even though the mailhouses and service bureaus themselves may be using Arc Tangent's software.

Scott Ohlman
Waukegan, Illinois

LETTERS ON LETTERS

There has been enough lambasting of John C. Dvorak in your Letters section. And the debate as to whether or not *Windows* will change the world forever has rung through your pages for long enough. How about ideas, however simple and uninteresting, rather than a battle of words about bits and bytes?

Howard J. Herman
Hoboken, New Jersey

I keep reading about people knocking or praising GUIs, *Windows*, OS/2, and the rest. This editorial space could be better used to tell the users what they want and need to hear about these different products: what other users think of a product, what problems they have had, solutions, and so on.

Regardless of what the experts say, it is the end user who ultimately determines a product's viability. Maybe you could oust Dvorak, Seymour, Zachmann, and the others and use the space for letters from the user. You would save money, too.

Albert D. Pollard, Jr.
Ruth, California

It seems that every month there is a rash of letters complaining about poor ol' John C. Dvorak. This occurs in both *MacUser* and *PC Magazine* with about the same frequency. Each camp complains bitterly about John's bias toward the other.

I subscribe to both mags and will go to bat for poor ol' John. He is probably the most unbiased columnist in each magazine. He doesn't play favorites; he blasts them all!

Keep 'em fuming, John!
Scott M. Bolton
Caldwell, Idaho

It is so entertaining to watch hundreds of people complain to, argue with, and suck up to your columnists. The first thing I do when your magazine arrives in my mailbox is turn to the Letters section and see what all of us nobodies in the computer world have to say to top-notch writers who, most of the time, specialize in what they are writing.

Steve Mulligan
Carp, Ontario, Canada

CORRECTIONS & AMPLIFICATIONS

The correct phone number for ViewSonic (New & Improved Briefs, June 11, 1991) is 213-946-0711.

HOW TO WRITE TO PC MAGAZINE

We welcome your comments, complaints, insights, and suggestions. Please send them to Letters, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see page 10 for access information). All letters become the property of *PC Magazine* and are subject to editing.

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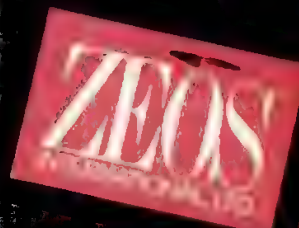
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Tt fell from the night sky undetected. By morning, it was pushing up innocuously through the moist, warm soil. Perfect. For the entire world would certainly take note soon enough.

In the oxygen-rich environment of earth,

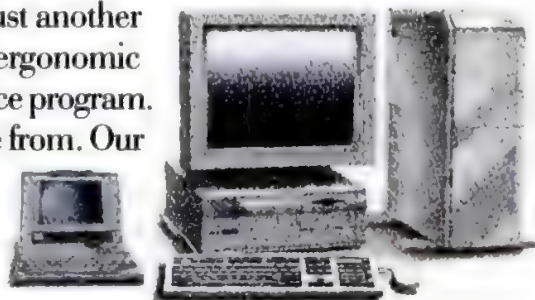
our little interstellar transplant experienced accelerated mitosis. On the first day it increased its height by half. On the second day by a third, on the third day by a quarter and so on. Can you determine, at this rate, how long it'll take to achieve its final height of one hundred times its original height?

Keep in mind, as you size up this visitor, that the rate of growth may seem greater at first. As is often the case in business, early growth can be markedly stronger when a product category is new and innovation is rapid. But it can flatten out as the market swells and matures.

Case in point, personal computers. Meteoric sales at first. Then a slowing. Today, growth is still there, but the incline is less steep. And there are some 300 brands fighting for that sluggishly growing chunk. If it weren't for the surge in notebooks, PC growth would probably be flat as a floppy.

So why on earth, in the midst of all this, would Wyse dare introduce just another line of PCs? We wouldn't. Our Decision Series is a far cry from just another line. With more performance, more flexibility and more ergonomic advantages at—it's true—less cost. All backed by a total service program.

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Why so? Because as we've grown over the years, our name has become synonymous with terminals.

So much so that the very notion of a Wyse PC took a little getting used to at first.

Of course, the introduction of our *Unix World* award-winning 9000i helped change things. This 160 MIPS, multi-user, true symmetric multiprocessor system makes it very clear that Wyse is a bit more than just the second largest terminal manufacturer.

The recent introduction of our eyebrow-raising DecisionMatesx notebook PC should help bring further clarity to the picture. As should this little nugget: according to information released by International-Data Corporation in December 1990, guess who ranked second behind only IBM as the primary vendor of PCs to value added resellers? The correct answer appears below in fairly large capital letters. As to the correct answer regarding our mutating extraterrestrial, well, you'll need to turn to page 482 for that.

To receive more information on any of the Wyse Decision Series PCs, and/or a free poster of further Cerebral Aerobics, just call us at 1-800-GET WYSE.

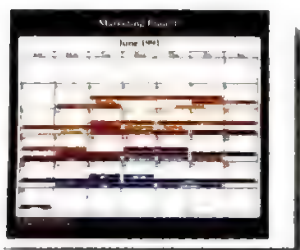
The lesson in all this: if you're contemplating the acquisition of some new terminals, do as you'd normally do and look into Wyse.

If you're contemplating the acquisition of some new PCs, do as you might not normally do. And look into Wyse.

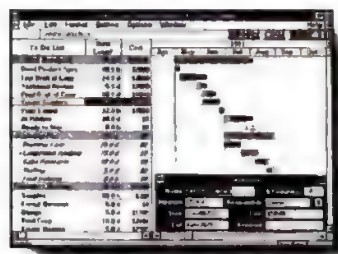
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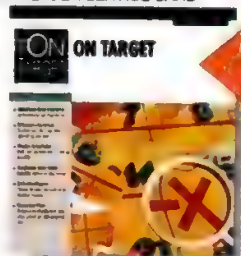
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SYMANTEC.

by
Gus Venditto

Pipeline

A Look at the Trends Shaping the Personal Computer Market

Plans to Make ISDN Work Nationwide Get A Mild Shot in the Arm

ISDN (Integrated Services Digital Network), the program that promises to bring 128-kilobit-per-second digital telephone service to every desktop in the land, has at times seemed like a distant dream.

According to Dennis Hayes of Hayes Microcomputer Products, ISDN reached "a spike of expectation in 1986 and 1987, followed by a valley of disappointment."

At least one company that pioneered ISDN equipment for the PC has gone out of business. And companies that had begun ambitious ISDN applications development have changed their priorities to other topics.

The responsibility for installing the switches and upgrading equipment throughout the country resides with the seven RBOCs (Regional Bell Operating Companies).

Recently, the group tried to revive some of the expectations for ISDN. In public meetings this summer, senior executives of each telephone company were joined by representatives of major non-Bell telephone companies (like CONTEL and GTE), and telephone switch manufacturers (such as AT&T, Siemens, and Northern Telecom) to confirm that there are active plans to deploy ISDN in the U.S. in a consistent and predictable manner (see table at right).

While the high-level announcements about ISDN installations were the cornerstone of these meetings, some new programs were also introduced that are designed to assist the smaller companies that need to make the

end-user data communications hardware and software required if ISDN is to ever reach the public.

One of the most significant programs is an offer from the Corporation for Open Systems to certify equipment that meets the National ISDN I standards published by Bellcore, the separate R&D agency of the RBOCs (call Bellcore at 800-992-4736 for information on the specifications).

All of the RBOCs agreed to make laboratory and testing facilities available to companies developing ISDN products. And the National ISDN Users' Forum showed how to develop and use application program interfaces (APIs) for combined data and voice on ISDN.

At the very least, these recent announcements confirm that ISDN is not dying in the lab: It

will make it to the home and office eventually.

But the work is not yet on a breakneck schedule. The tight coordination that will be needed between the local phone companies and other companies guarantees that it will be a long, drawn-out process.—*Reported by Frank J. Derfler, Jr.; written by Derfler and Gus Venditto*

Compugraphic Gears Up to Support True Type Fonts

The release of *True Type* in Windows is still several months away, but companies selling hardware or software for PC printing are getting ready to work with it.

Agfa Compugraphic will convert its typefaces to the *True Type* format. And the company will upgrade Intellifont, the technology that's at the heart of HP's LaserJet resolution enhancement, to enhance the printing of *True Type* fonts.

Agfa Compugraphic licenses Intellifont to printer manufacturers, and it's too early to say which laser printer makers will be using the new version.

Changes at Sears and Businessland Are In Line With Recent Trends

In recent years, there's been a growing split in the way PCs, peripherals, and software are sold. The stores that got the whole thing started—the ComputerLands and Businesslands—have been moving increasingly toward LAN integration and system support.

It was direct mail sales that first took the lion's share of PC sales growth away from these retail chains, but in recent years, superstores and electronics chains have become a significant part of the sales scene. Both trends have been accelerating.

Businessland, which has struggled for months, was acquired by JWP, a \$3 billion technical services company that is as comfortable retro-fitting an automated factory for a climate-controlled environment as it is in installing fiber-optic cable throughout a downtown office building. JWP sees Businessland as a vehicle to expand its systems integration business deeper into LAN-based services.

Meanwhile, Toshiba laptops will be joining the Packard Bell PCs and IBM PS/Is that Sears sells in 350 Brand Central appliance outlets.

Until now, Sears has carried top-of-the-line PC products like Toshiba laptops only in its business center outlets. The department stores carried only the lower-price products that Sears thought would be enough to satisfy the individual consumer, but the addition of Toshiba laptops is a reflection of how much more sophisticated the average consumer has become in buying PC products.

Initially, only the T1000LE and T1200XE will be carried.

Finally, Dell continues to

CONTINUES ON PAGE 30

GROWTH PLANNED FOR ISDN BETWEEN 1990 AND 1994

RBOC	1990	1994
Ameritech	0.3 percent	87 percent
Bell Atlantic	0.1 percent	90 percent
Bell South	1.9 percent	50 percent
NYNEX	0.2 percent	27 percent
Pacific Bell	0.1 percent	40 to 50 percent
SW Bell	0.2 percent	47 percent *
U.S. West	0.4 percent	76 percent *

This chart shows the percentage of telephone lines that could provide ISDN service in the operating areas of each of the Regional Bell Operating Companies (RBOC) by the end of 1990, along with the projections for late 1994.

* in metro areas

Pipeline

CONTINUED FROM PAGE 29

seek ways to expand beyond the mail-order-only philosophy that got it started. It first broke with the tradition earlier this year when it started selling its machines in Comp USA (formerly Soft Warehouse) stores, which are giant barnlike outlets with thousands of PC products.

Now, Dell will sell PCs through Staples, the supermarket-sized office supply store, right next to the pencils and paper clips.

Staples has 105 stores across the nation.

Work on 4-Megabit RAM Chips Gets Serious

The silicon fab plants are starting serious work to produce 4-megabit RAM chips.

NEC is beginning to ship the 0.7-micron 4Mb chips that it's fabricating at its Roseville, California, plant. The chips have a 60-nanosecond rating.

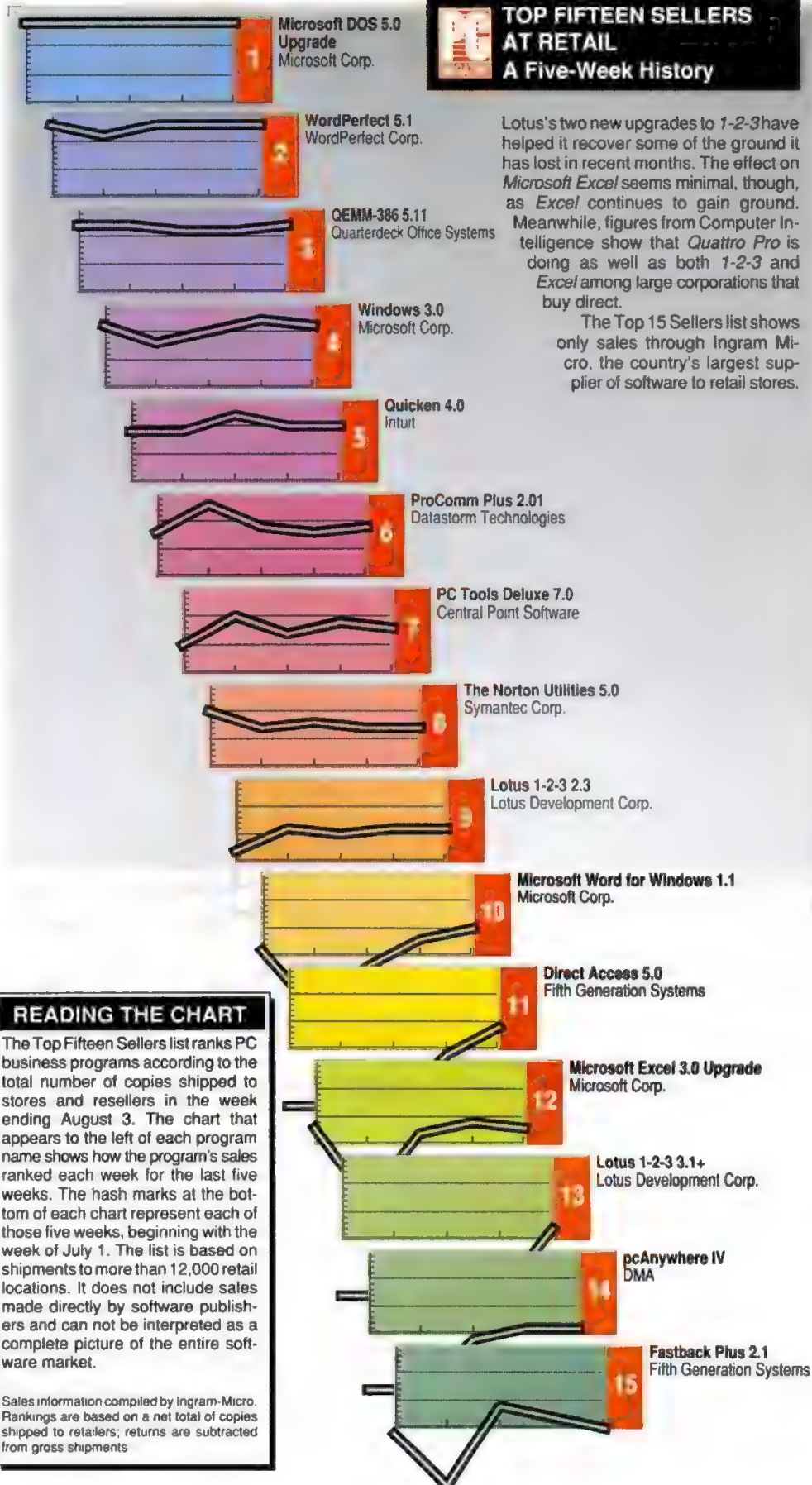
Meanwhile, Acer and Texas Instruments are involved in a joint venture to build 0.8-micron CMOS DRAMs in Taiwan, with plans to move to half-micron levels later on. These chips will be rated at 80 nanoseconds and they'll be available in large quantities early next year.

Rest in Peace, 8514/A

Several months after other video board companies finally began to adopt the 8514/A video standard, IBM suddenly dropped the product from the PS/2 line. The announcement was made quietly in a letter sent to large customer sites.

That leaves XGA as IBM's only better-than-VGA standard for mainstream PS/2 graphics. So far, no one's announced plans to copy the XGA standard, although IBM has indicated it's eager to help other companies develop their own versions.

8514/A was introduced in April 1987 as part of the broad PS/2 product line launch. One of the reasons it never met with success is that IBM sold only an interlaced monitor that had provided an unacceptable, washed-out picture.





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For further information on the PanaSync C1395 Multi-Frequency Monitor, telephone 1-800-742-8086.

*MAC II is a registered trademark of Apple Computer, Inc.
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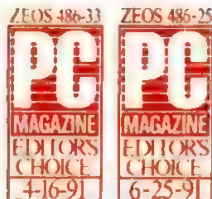
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CIRCLE 165 ON READER SERVICE CARD

First Looks

Hands-on Reviews of the Latest Products

FoxPro 2.0 Leaves the Rest of the Database Pack in the Dust

by Jeff Rosenberg

The buck stops here. Fox Software's *FoxPro* 2.0 is so fast at some operations you'll find yourself looking under the hood to see if someone slipped a 50-MHz 486 processor into your favorite AT clone. But trust me, even such a silicon upgrade wouldn't register performance improvements like these. In some instances *FoxPro* 2.0 is literally thousands of times as fast as the competition.

Speed isn't uncharted territory for Fox Software. Its previous release, *FoxPro* 1.02, was given the Editors' Choice award in our review of relational databases in the May 28, 1991, issue. There we said that *FoxPro* had "amazing speed." The new release finished our benchmark test suite in anywhere from 19 percent to 27 percent less time than the amazing Version 1.02, depending on whether you use the standard release or the bundled 386-or-better extended version.

Compared with the numbers published in the relational database story, *FoxPro* 2.0 finished our tests in one-ninth the time that Ashton-Tate's *dBASE IV* took, or one-sixth the time that Borland's *Paradox* required.

But hidden in these numbers is a more dramatic story—the new Rushmore technology. This patent-pending data-access technique yields absolutely staggering performance gains in situations where it can be employed. Some of the benchmark tests used Rushmore, allowing *FoxPro* 2.0 to complete a test in as little as 0.5 percent of the time required by *FoxPro* 1.02.

FoxPro's new SQL SE-



FoxPro 2.0 lets you create attractive screens that use pull-down menus, push buttons, scrollable text edit regions, pop-ups, list boxes, and more.

LECT command uses Rushmore as part of its optimization strategy. SELECT is particularly adept at retrieving data from multiple databases and is preferred in many situations over traditional procedural code.

For example, a single SELECT can often accomplish what would otherwise require numerous *FoxPro* commands. And the SELECT statement puts the onus on *FoxPro* to decide the best way to retrieve the data. In many cases, SELECT can outperform even the most seasoned *FoxPro* programmer at accomplishing certain tasks.

But SELECT is unfamiliar territory for most *FoxPro* programmers; there is a learning curve. A poorly constructed SELECT can generate vast amounts of data, and in some instances SELECT's set orientation is not preferable to the record-oriented approach, which can have far more conservative disk and memory requirements.

In addition to SELECT, Fox has added support for two other SQL statements: CREATE TABLE and INSERT INTO. The three are welcome enhancements and completely integrated with the *FoxPro* language.

Complementing Rushmore and SELECT are improved index files. *FoxPro*'s new compound index file (.CDX) lets you combine what would previ-

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ously have been many individual single-entry index files into one file. In addition, Fox now employs a compression algorithm that automatically stores the .CDX in a compact format. This lets *FoxPro* keep more of the index in memory, where Rushmore and SELECT can benefit from not having to read the disk as often.

Fox's compression algorithm produces significantly smaller index files than the competition. Testing showed that creating an index tag on a 25-byte character field using a database with approximately 42,000 records yielded an index file that was one-fifth the size of the same index created by Ashton-Tate's *dBASE IV*. And *FoxPro* took 11 percent less time to create the index.

If you've wanted to use

CONTINUES ON PAGE 36

HP's Colorful Entry into The Gray World of Scanners

by Alan Post

That little *c* in the HP ScanJet IIc's name refers to its new-found color capabilities, but there's nothing little about the way HP has implemented its first color scanner except for the price tag.

The \$2,195 HP ScanJet IIc

carries the same list price that the monochrome ScanJet Plus had last spring. (The ScanJet Plus was the Editors' Choice winner in our August 1991 review of gray-scale scanners and now lists for \$1,590.)

Like its monochrome predecessor, the ScanJet IIc can handle black-and-white and 8-bit

CONTINUES ON PAGE 37

First Looks

FoxPro

CONTINUED FROM PAGE 35

some of *FoxPro*'s interface enhancements (radio buttons, check boxes, push buttons, and the like) in your own programs, your wish has come true. *FoxPro* 2.0 supports all of these through enhancements to the @.GET command and a new command, @.EDIT.

Version 2.0 includes a duo of programmers' tools. First, there's the Project Manager. Think of it as a sort of home base for development work—the recommended starting point for all *FoxPro* development projects. With it, you are enabled to group together all of the

files, programs, screens, reports, and so on needed to create an application. Then, when you want to check and make sure the project is up-to-date, you tell the PM, and it will refresh only those files that have changed. When your project is ready to be made into an application, the Project Manager produces the final version.

The PM can be used to create *FoxPro* applications that use the *FoxPro* runtime version. With the new optional distribution kit (\$500), you can also create two types of executable programs: standalone and compact. The standalone .EXE contains everything required to run your application in one file. These .EXEs are huge, frequently more than 1MB in size, because they include a great deal of *FoxPro*'s own internal code. A compact executable is much smaller in size but requires the presence of some central *FoxPro* libraries.

The new object-oriented screen builder lets you draw your data entry screens and have *FoxPro* generate the appropriate code. You can use the mouse to place fields, text, lines and boxes, and any of *FoxPro*'s new controls in a design window while assigning various attributes and attaching code snippets to the objects.

The initial release of 2.0 shipped with a number of problems. Fox, however, has responded quickly and has a system in place for making patches

available on-line via CompuServe.

So is 2.0 perfect? No. Despite advertisements touting *FoxPro*'s Mac-like qualities, *FoxPro* is still for the most part a developer's environment. Fox Software needs to pay more at-

tention to novice users.

Still, from any vantage point, *FoxPro* 2.0 is an order of magnitude better than 1.02, which was already ahead of the rest of the pack. For PC-based database development, there's nothing faster. ■

FOXPRO'S NEW MAGIC

Rushmore technology, Fox Software's patent-pending data-access technique, comes into play on any command with a FOR clause.

One of the requirements is the presence of a basic optimizable expression, which occurs when one operand exactly matches an index expression in an open index file and the operator is one of the supported relational operators.

For example, UPPER(LAST)="SMITH" is optimizable if an index has been created on UPPER(LAST). Basic optimizable expressions can be combined using the AND, OR, and NOT operators to produce complex optimizable expressions. By definition, such a combination is fully optimizable.

If a basic optimizable expression is combined with one that is not optimizable, the resulting expression can be partially optimizable or not optimizable at all, de-

pending on a set of rules.

For instance, a partially optimizable expression would result if we used UPPER(LAST)="SMITH" .AND. "Author" \$ DESCR, since the second expression uses the \$ operator, which is not supported. The *FoxPro* commands and functions manual provides tables detailing the rules that apply.

There's a fair amount of magic in just how all of this works, and with a patent pending, Fox isn't talking. Suffice to say that with most commands, Rushmore requires open index files to do its work, and that it creates a result set based upon the FOR expression.

The SQL SELECT command is the exception to the "index files must be open" rule. The SELECT command has no requirements. It will open databases and even create temporary indexes as needed.—SR

FACT FILE

FoxPro, Version 2.0

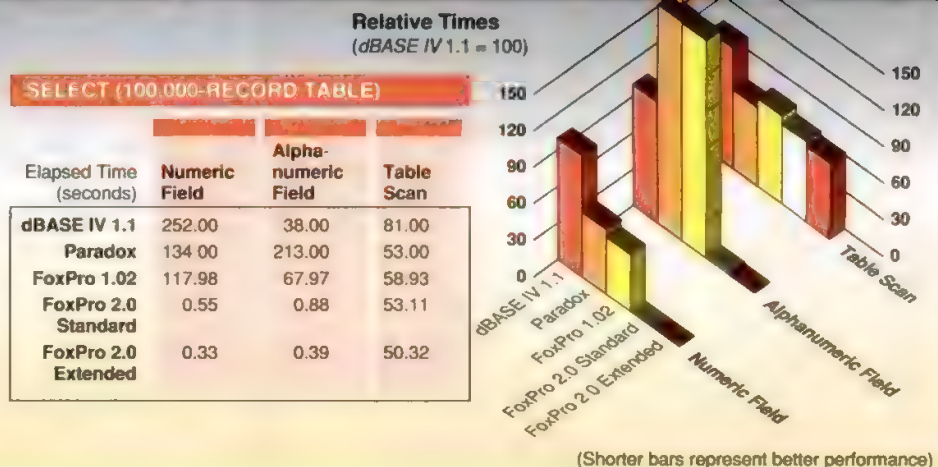
Fox Software Inc., 134 W. South Boundary, Perrysburg, OH 43551; 419-874-0162.
List Price: *FoxPro*, \$795; *FoxPro*:LAN, \$1,295.
Requires: 512K RAM, hard disk, DOS 2.0 or later. LAN version requires DOS 3.1 or later and network software supporting the NetBIOS interface.
In Short: *FoxPro* 2.0 is the undisputed performance king. If you're developing PC-based database applications, there's nothing faster.

CIRCLE 788 ON READER SERVICE CARD

PERFORMANCE TESTS: FOXPRO 2.0

FoxPro 2.0's Rushmore technology with its query optimization is far superior to the other databases in extracting data. All four of the packages scanned the table within about 30 seconds of each other, but *FoxPro*'s retrieval times were dramatically better than the competition's.

■ The Select tests determine the time needed to scan a table of 100,000 records. The tests then measure the impact of storage organization on record retrieval by timing how long each package takes to select records based on index fields of two different data types: numeric and alphanumeric.



First Looks

HP ScanJet IIc

CONTINUED FROM PAGE 35

gray images. Unlike the less-expensive model, it can also be used to scan spot color, color halftone, 256-color, and 24-bit color images. HP refers to the 24-bit mode as "millions of colors," and while this may be a less technical term, it is certainly an accurate description.

The scanner has a 400-dot-per-inch mechanical resolution, but through software HP is able to tune the images for higher-resolution devices (such as typesetters), to 800 dpi or better. The scanning program includes utilities to calibrate both your screen and your printer (or other output devices) for more accurate reproduction. The scanner unit has a single scan head with twin fluorescent lamps and a three-stripe CCD (charge-coupled-device) mechanism that permits single-pass color scanning.

The ScanJet IIc's scan head does not travel smoothly down the bed; it will periodically stop, reverse directions for a short distance, and then proceed for a short distance again before repeating its jitterbug dance.

According to an HP representative, this happens because the scanner is capable of generating as much as 600K of data per second, which is more than

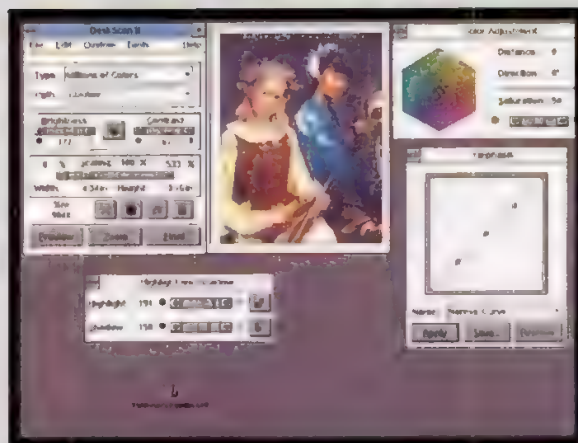
the host computer (either PC or Macintosh) can accept. If the head were to simply start and stop, there would be the risk of lost or distorted data due to registration or head acceleration; instead, the jitterbug step ensures that the head is moving at full speed and covering the correct part of the image when it starts transmitting again.

The data is sent to the PC via an included 8-bit SCSI expansion card. (A Micro Channel version is also available.)

The ScanJet IIc's software runs under *Windows* and relies primarily on two pieces of software that are included in the package: *DeskScan* and *Publisher's Paintbrush* (Version 2.0 from ZSoft). The install program runs under *Windows* and creates a separate Program Manager group for the ScanJet IIc's software.

DeskScan is similar to the scanning program that is included with the ScanJet Plus, but it is more powerful and has additional features to handle the new color support. The program is designed to be easy for novice and casual users but still provide sophisticated controls for advanced users.

To create an image (color, gray-scale, or black-and-white) you place the original on the scanning surface, select the Preview command, specify an image type and the intended output device, and select an area of the image to be used in the final



The ScanJet IIc's *DeskScan* software adds color features to HP's scanning repertoire. There are automated settings as well as sophisticated scanning-adjustment tools for users who want greater control over image quality.

scan. You then click on a button to perform an automatic exposure adjustment (contrast and brightness) for the selection, adjust the scale if desired, and select the Final command. This in turn prompts you for a filename and format: encapsulated PostScript (EPS), *Windows* .BMP, *Publisher's Paintbrush* .PCX, or TIFF 5.0 (both compressed and uncompressed).

The scanning controls are designed so that you can get a good quality scan from the automatic settings, but if you want to tweak the settings, *DeskScan* provides tools like Highlight and Shadow tool that you can use to read levels directly from the preview scan image.

You can print images directly from within the *DeskScan* program, but it's likely that you'll want to use the *Publisher's Paintbrush* editing program instead. This is a bitmap paint program with a host of powerful editing features designed specifically for gray-scale and color images.

The weakest aspect of the ScanJet IIc package is the documentation, which provides only the most general information on the software features and capabilities. The documentation was consciously designed to rely heavily on an on-line *Windows*-based help system.

Under *DeskScan*, the on-line help is implemented as an added feature called Quick Help; with Quick Help activated you can

click on any icon or command and receive detailed information about that item. Once you get the hang of it, this on-line documentation is excellent, but you'll need to cultivate the proper find-it-on-line mind-set.

You might actually find yourself tempted to buy the older ScanJet Plus, especially in light of the new price reduction. But the ScanJet IIc costs only a little more, and offers so many significant additional benefits that it is hard to justify buying anything less. If you have been putting off purchasing a desktop scanner because you weren't quite sure what you needed, you can relax. From monochrome to gray-scale to color, the HP ScanJet IIc has everything you need.



Scanned as a 24-bit image, this is how the ScanJet IIc scans and displays a color photograph. The results are strikingly photo-realistic.

**FACT FILE**

HP ScanJet IIc
Hewlett-Packard Co., 19310
Pruneyard Ave., Cupertino, CA
95014; 800-752-0900.
List Price: Including ISA or
MCA interface, \$2,195.
Requires: 640K RAM, 4MB
hard disk space, *Microsoft*
Windows 3.0.
In Short: The HP ScanJet IIc
offers 24-bit single-pass color
scanning for the same price as
last year's gray-scale scanner.
The added features and image
quality make it attractive for all
users, whether or not they will
be using color output.

CIRCLE 707 ON READER SERVICE CARD

First Looks

Ice: Baler's Spreadsheet Add-In Keeps Worksheets Under Tight Rein

HANDS ON
by Craig Sorenson

Lotus 1-2-3 compilers provide numerous benefits for spreadsheet application developers: They provide macro and formula security, allow customization of 1-2-3's user interface, speed up execution, reduce RAM and disk consumption, and generate standalone executables that don't require users to own copies of 1-2-3.

They also have disadvantages. They're expensive, they generate programs that can't make use of 1-2-3 add-ins, and they make applications that can't be modified, even in benign ways. An application compiled with Baler Software Corp.'s popular \$795 *Baler XE*, for example, can't accommodate new rows or columns or formula changes of any kind.

To answer some of these problems, Baler has introduced *Ice*, a new twist on worksheet customization. *Ice* is an 80K add-in that provides the security and interface benefits of *Baler XE* at a much lower price (\$395).

Worksheets that are "iced" don't run faster than normal worksheets, and users must own a copy of 1-2-3 in order to operate them. But worksheets can be modified (to whatever extent the developer permits), and users can enjoy the benefits of the standard 1-2-3 environment—including the ability to use certain (but not all) add-ins and to link iced worksheets to un-iced .WK1 files.

Ice adds 70 keywords to the 1-2-3 macro language, which developers use to customize their applications. A separate Build program then puts the finished application on a floppy disk, along with a runtime version of the *Ice* add-in, a .COM program that launches the finished application, a custom title-screen file, and a setup program. *Ice* developers get a royalty-free license to mass-produce their wares.

After running the setup program to put the application on their hard disks, end users invoke the .COM program, which loads 1-2-3, attaches the runtime add-in, and retrieves the iced worksheet (which cannot

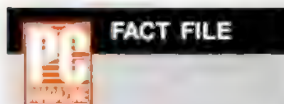
be opened directly from 1-2-3). This elaborate scheme ostensibly eliminates one more place where users can go astray (no need to learn about /FR), and the custom title screen adds perceived value to the developer's labors. (The developer can also tailor the setup program's title screen.)

The .COM program can bear a descriptive name (within the eight-character DOS limitation), so an untutored user can do the budget simply by typing BUDGET.

Because many of the macro-language extensions are direct counterparts of *Baler's* CUSTOMIZ commands, *Ice* can also serve as an interactive development environment for those who intend ultimately to compile. A few critical components found in *Baler's* previous spreadsheet compilers—notably formula cell override, /Baler Security, and virtual memory support—are missing in *Ice*, however.

Like *Baler XE*, *Ice's* language extensions are rich in security and interface features. A special AUTOEXEC identifier (\\) ensures that all security provisions can be effective immediately on startup (preventing the user from trumping security measures with \O). Macro keywords can be used to restrict cell-pointer movement, disable function keys (as well as the slash key), remove whole nodes from the 1-2-3 menu tree, and encrypt worksheet files (defeating *Magellan* and other viewers). Formulas can be made invisible, and an optional, somewhat Byzantine, lock-and-key scheme can prevent other *Ice* owners from peeking at a developer's code.

Other keywords enable you to validate data entry, install your own help system, modify 1-2-3's menu tree, assign macros to particular non-alpha keys, and utterly transform the appearance of a 1-2-3 worksheet. You can eliminate the frame, assign color attributes to 17 different display components (but no value-dependent colors), create pop-up message boxes, and allow "in-cell" editing (as opposed to editing on the formula-input line).



Ice, Version 1.0a
Baler Software Corp., 1400 Hicks Rd., Rolling Meadows, IL 60008; 708-506-9700.
List Price: \$395.
Requires: 80K RAM for CORE.ADN and ICE.ADN, Lotus 1-2-3, Release 2.2 or 2.3.
In Short: Baler's *Ice* provides many of the same benefits as Baler's spreadsheet compilers at a lower cost. Developers are enabled to add security and custom-interface features to 1-2-3 applications, but applications do not run faster and end users still need to use 1-2-3.

CIRCLE 446 ON READER SERVICE CARD

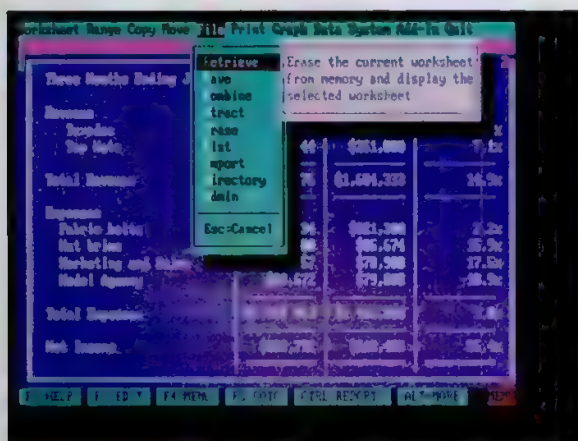
Working with other add-ins should be a principal advantage of the *Ice* approach, but here there are some irksome limitations. For starters, *Ice* uses 80K of conventional memory, which doesn't leave much room for other add-ins. Beyond that, *Ice* goes straight for the innards of 1-2-3 and hence does not cooperate well with other high-power (similarly ill-behaved) add-ins. *MED* is out, the 1-2-3 *Macro Manager* is out, and there are serious limitations to the compatibility of *Ice* with either *WYSIWYG* or *Impress*.

In text mode, *WYSIWYG* gets along fine with *Ice*. In graphics mode, however, *WYSIWYG* overrules many of the *Ice* commands that concern screen presentation.

Ice's README file details the limitations and shows you how to make the best of the difficult situation.

Ice also has some rather rough edges when used with 1-2-3, Release 2.3. The mouse is unavailable, but its cursor remains on-screen. The MODE indicator occasionally displays something that looks like a comic-strip bleepout, and screen colors behave abnormally on a return from /System. On top of these minor problems, Baler's manual could use a lot more examples and a thorough proof-reading.

Small glitches aside, *Ice* is a fine idea and a welcome addition to the Lotus 1-2-3 developer's arsenal.



Ice lets you totally change the look and feel of a 1-2-3 worksheet; you can prevent changes to cells and add new menu commands.

PC
MAGAZINE

FIRST LOOKS

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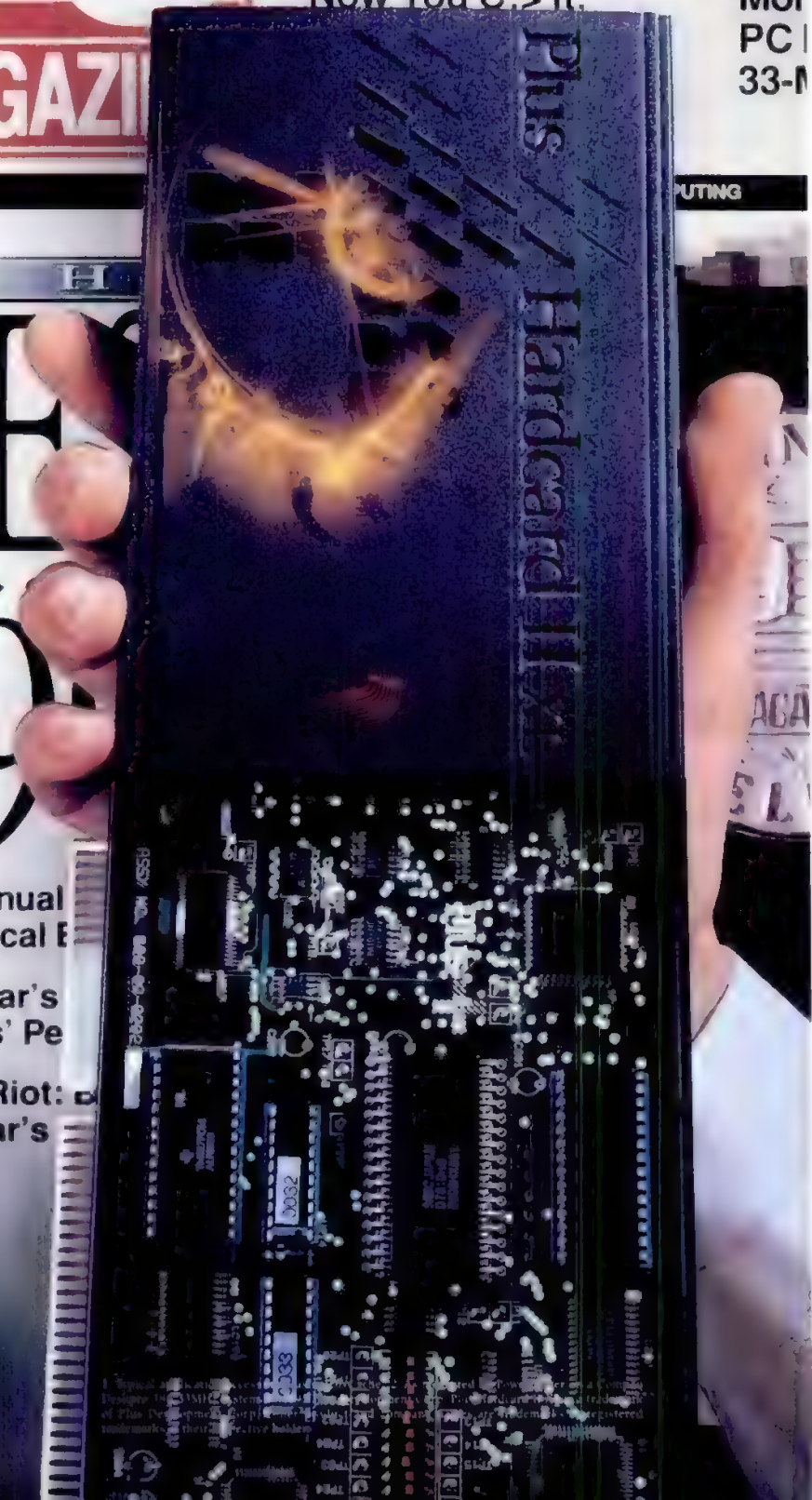
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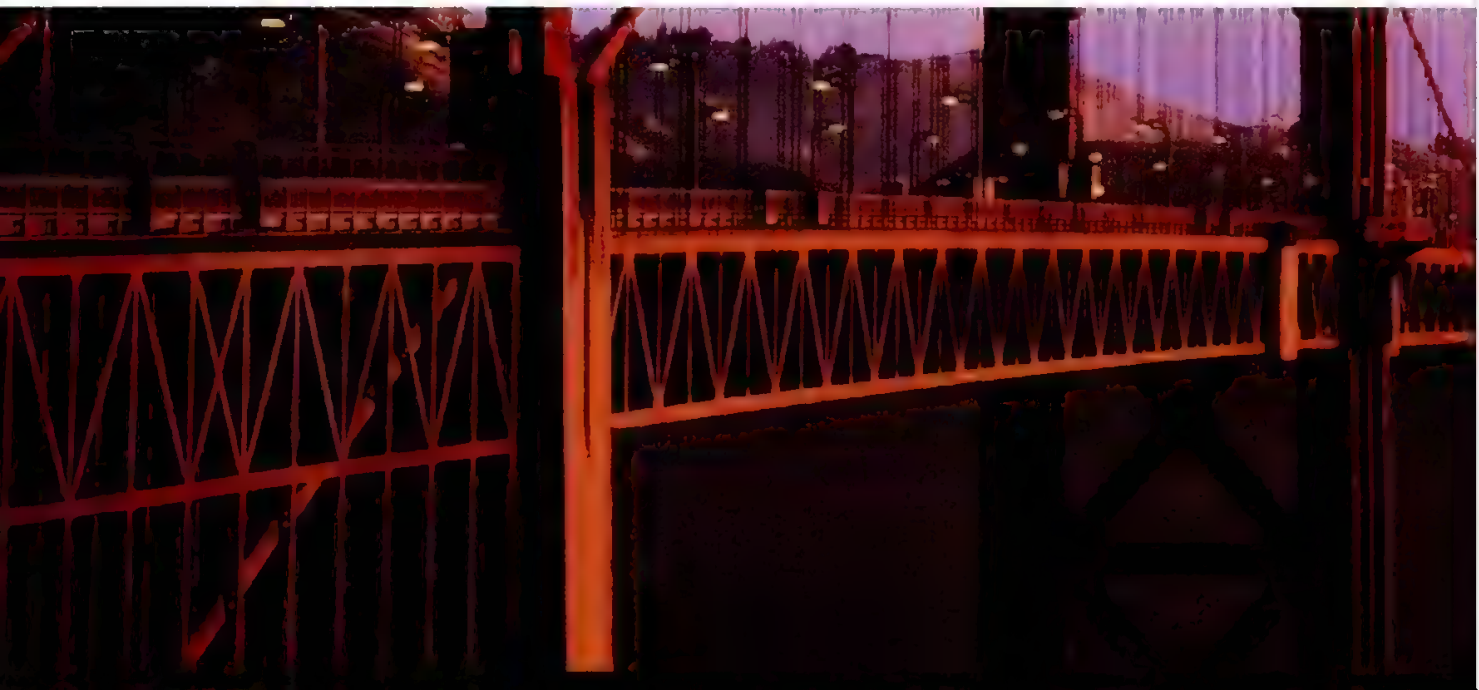


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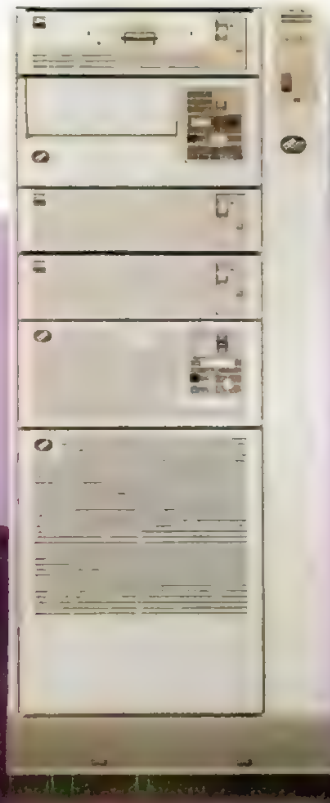
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First Looks

On the Heels of Visual Basic, Another BASIC Breakthrough

HANDS ON
by Kaare Christian

Realizer, a smooth, modern version of BASIC that builds *Windows* applications, is shattering the notion that you have to be a C programmer to program for *Windows*. The \$495 language, from Within Technologies, includes a collection of routines that let you create and manage windows, menus, and dialog boxes.

The program creation process is about as straightforward as one could imagine: The *Windows* message-based paradigm is mostly hidden, and almost all details are managed for you, automatically. Text input and output is extremely simple, and printing is a breeze.

Realizer can be compared with Visual Basic (VB) (see First Looks, August 1991), VB's strength is its adherence to the traditional *Windows* paradigm, which makes it a natural for prototyping and for people who are comfortable with the *Windows* event-driven model.

People with experience using BASIC, and people who only program infrequently, may be more comfortable with Realizer's approach. And any application that can make use of its powerful form tools should probably be written in Realizer.

Realizer programs are a more traditional hierarchy of subroutines, following the structured programming model. Although VB's event-driven model is closer to how *Windows*

actually works, and it corresponds to how one develops for *Windows* using C, Realizer's procedural model is certainly more in tune with the needs of casual *Windows* developers.

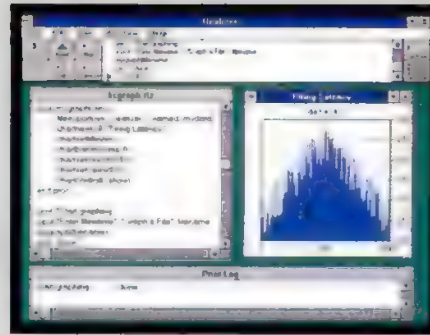
Compared with VB, Realizer has few data types, it lacks multidimensional arrays, and its data structure facilities are primitive. But Realizer includes many useful, sophisticated features not found in VB, such as the Chart tool, which makes it easy to display bar, line, and scatter charts.

Other useful Realizer form tools include sheets, which provide a spreadsheet-like form whose cells can be edited; boards, which are tabular forms for noneditable data; logs, which are for text entry and display; and forms, which are generalized *Windows* dialog boxes.

Exceptionally powerful aspects of Realizer are its communications library, its convenient printing facility, its task scheduler, and its animation library. Realizer lets you access third-party DLLs, use *Windows* DDE, and use the *Windows* Clipboard.

Realizer has two ancillary tools, a form development tool, which is roughly analogous to the *Windows* SDK dialog box editor, and a .EXE builder, which produces standalone *Windows* programs. Both FormDev and EXEbuilder are written using Realizer—a powerful testament to the product.

The Realizer programming environment is an attractive



This simple Realizer program, whose source code is shown in the middle left window, plots a numeric data file.

Windows application that lets you edit, run, and debug your program. You can execute your program from the beginning, or you can highlight a few lines and execute them individually, making Realizer both a powerful environment for creating complex applications, and an exploratory environment.

Realizer debugging is straightforward compared with VB, because of its procedural programming model. The integrated debugger, which is clearly one of Realizer's strengths, will intervene if Realizer detects an error. The debugger lets you set breakpoints, single-step through applications, display the values of variables, and display the function call tree. The major feature missing is the ability to watch a variable and stop the program when some specified condition is met.

The documentation consists of a 350-page user guide, a 590-page reference guide, and a half-dozen skinny manuals covering late-breaking topics. The manuals are well organized and well indexed, and the reference contains useful appendixes that detail Realizer keywords and constants.

It's not realistic to expect any BASIC for *Windows* to be fully QuickBASIC-compatible; some things are bound to be different. In Realizer, Within has made an effort to support many BASIC functions and constructs. The company also supplies a short section in the manual on how to convert QuickBASIC programs to Realizer.

Developing simple Realizer applications is, as it should be, simple. The following is a complete four-line program that dis-

plays a graph of data stored in a file:

```
fileimport("data.kc",
_realizer, _named)
chartnew(10)
chartbar(mydata;4)
chartcontrol(_show)
```

Of course, the program needs embellishment to make it a more useful program, but step-wise embellishment is what makes Realizer so attractive. A somewhat refined version of this program is shown in the screen photo.

Within Technologies' Realizer, like Microsoft's Visual Basic, is a *Windows* programming breakthrough. Picking a winner is impossible; both are excellent, and serious *Windows* shops should have a copy of each.

Your choice between these two extraordinary tools rests on this conceptual difference: If you prefer a straight *Windows* programming environment, try VB, but if you prefer *Windows* with a more traditional twist, then Realizer is for you. ■

REALIZER VERSUS VISUAL BASIC

	Realizer	Visual Basic
Price	\$395	\$199
Programming model	Procedural	Event-driven
Visual design tools	Yes	Yes
Data types	Real, string	Numerous
Arrays	One-dimensional	Multidimensional
Distribution	Win.EXE or encrypted code	Win.EXE

FACT FILE

Realizer

Within Technologies, Laurel Corporate Center, #201 South, 8000 Midlantic Dr., Mt. Laurel, NJ 08054, 609-273-8881.

List Price: \$395

Requires: 1MB hard disk space, *Windows* 3.0.

In Short: A breakthrough product that brings the convenience of BASIC to the once onerous task of *Windows* software development.

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CIRCLE 258 ON READER SERVICE CARD

First Looks

16-Mbps Pocket LAN Adapter Is Ready To Fly but Parallel Port Keeps It Grounded

HANDS ON
by M. Keith Thompson

When it introduced its 4-mega-bit-per-second Pocket LAN Adapter, Xircom was the first with a portable Token-Ring adapter.

Now Xircom has the first external pocket adapter to provide 16-megabit per second Token-Ring capabilities. And the adapter's \$895 price tag puts it in the same ballpark as internal LAN adapters.

Xircom's line of adapters gives users a way to connect laptops via the parallel port, without requiring internal adapter cards or cumbersome docking stations. Savvy users have discovered that the benefits of an external LAN adapter extend beyond the laptop world.

The Pocket LAN Adapter is a useful tool for anyone who wants to quickly connect any computer to a network without worrying about setting interrupts, avoiding memory address conflicts, or scrounging for a screwdriver.

The Pocket LAN Adapter is small: roughly the size and weight of a deck of playing cards. The 12-volt power transformer is 2 inches square. Together, they weigh 12 ounces.

On a 16-bit network, the Pocket 16/4Mbps Token-Ring Adapter performs acceptably, but the parallel port will always be a bottleneck to super high-speed performance. Users attached to the network with the adapter will not see throughput differences between a 4-Mbps and 16-Mbps Token-Ring system because they view the network through the parallel port.

What they can do now that they couldn't before is to make connections to networks operating at 16 megabits per second.

Xircom's Pocket 16-Mbps Token-Ring Adapter comes with preconfigured software drivers for both *NetWare* and *LAN Manager* network operat-



The Xircom 16/4Mbps adapter ships ready to run on a 16-Mbps Token-Ring network. While the small unit can't give you the same performance as a 16-bit LAN adapter card due to the parallel port's limited throughput, it's your only choice for connecting a laptop to a 16-Mbps LAN.

ing systems—including IBM's *LAN Server* version of *LAN Manager*. In contrast, users of internal LAN adapters running *NetWare* must create their own drivers that specifically configure the *NetWare* IPX driver.

Since Xircom knows the I/O address and IRQ (interrupt) number of each possible parallel port, its product is ready to run right out of the box.

Xircom's NDIS (Network Driver Interface Specification) driver allows the Pocket 16-Mbps Token-Ring Adapter to operate with Microsoft's *LAN Manager*. Other companies, like Banyan, are also providing redirection software able to run over NDIS, so these products should work with Xircom's adapter, too.

Xircom ships The Madge Networks' popular *Smart LAN* software driver with the Pocket 16/4Mbps Token-Ring Adapter. The Madge software loads the media access control (MAC) layer element of the driver into memory on the Xircom adapter to free conventional RAM for other applications.

For example, on *NetWare* networks, the standard IPX COM uses about 18K of memory, but Madge's *Smart IPX* driver uses only 8K of RAM. On IBM *LAN Server* networks, a specific subset of *LAN Manager*, the *Smart* drivers save 24K of memory.

However, the software suite

@Mail Delivers E-mail From the Comfort of Your Spreadsheet

HANDS ON
by Rick Ayre

Mail-enabled application is another one of those new industry terms. More simply put, it means that you don't have to leave your application to access your e-mail.

@Mail, from Beyond Inc., is the "mail-enabled" answer for those who live inside their *Lotus 1-2-3* spreadsheets or *Symphony* environment.

@Mail installs as an add-in

**FACT FILE**

Xircom Pocket 16/4Mbps Token-Ring Adapter
Xircom, 26025 Mureau Rd., Calabasas, CA 91302; 818-878-7600.
List Price: \$895.
Requires: 4-Mbps or 16-Mbps Token-Ring network, computer with parallel port.
In Short: The best way to connect a laptop or PC to a 16-Mbps Token-Ring network without using expansion slots. Comes complete with drivers for *Novell NetWare*, *Microsoft LAN Manager*, and *IBM LAN Server*.

CIRCLE 453 ON READER SERVICE CARD

included with the Pocket 16/4Mbps Token-Ring Adapter lacks an Open Data Interchange (ODI) driver for *NetWare* 3.11. *NetWare* 3.11's ODI drivers allow multiple protocols to run over the same network adapter, and sophisticated users will increasingly ask for this capability to connect to Unix and TCP/IP-based servers over the network. You can still connect to a *NetWare* 3.11 server with the normal *NetWare* drivers.

Like its 4-Mbps predecessor, Xircom's Pocket 16/4Mbps Token-Ring Adapter works well and is easy to install. If you need quick, portable connectivity to a Token-Ring network, and your PC or laptop's speed through the parallel port is adequate, this product is for you. ■

and acts as a complete MHS e-mail system, seamlessly integrated into the 1-2-3 or *Symphony* interface. Those who know either *Lotus* program have little to learn in order to begin sending electronic mail. One version of @Mail accommodates both *Symphony* and 1-2-3. You simply specify your preference during installation.

From the 1-2-3 menu, @Mail is invoked with the /A (Attachment) and /I (Invoke)

CONTINUES ON PAGE 46

PHOTOGRAPHY: THOM O'CONNOR



Our New Departmental PostScript Printer Is So Efficient, You Might As Well Say It Prints Money.

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Increased office efficiency
results in increased profitability



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Maintaining one high-duty printer rather than 30 to 40 desktop printers is a cost advantage. That's good. But the real advantage comes when the speed, intelligence and flexibility of the new QMS-PS® 2000 changes an office cost advantage into a departmental profit center!

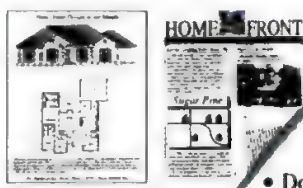
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*Contact QMS for availability of network options.

*Patent pending

First Looks

@Mail

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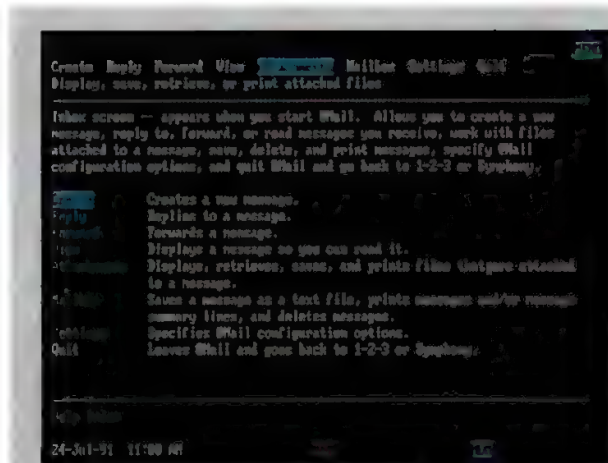
commands. @Mail's menus let you access the full range of e-mail functions: standard read, write, reply to, forward, print, and save.

And even though you send messages from within your worksheet, you are not limited to transmitting worksheets. You can also send messages by attaching almost any kind of file, including binary files.

If your attached files are stored on a shared network drive, for example, you may send them as virtual attachments—saving both time and disk space. The program includes a complete text editor, which you enter when you choose to create a message.

Naturally, @Mail caters to the spreadsheet user with some unique messaging capabilities. It can insert spreadsheet ranges into a text message and automate your e-mail interface with 1-2-3 or Symphony macros.

Among the sample macros discussed in the user guide and supplied on-disk are macros to attach and invoke @Mail, a quick-send macro, a macro to load an attached spreadsheet file into 1-2-3, and a macro to send a



Beyond's @Mail offers a complete electronic mail system in the form of a 1-2-3 or Symphony add-in.

spreadsheet to a mail group, solicit their comments, and then ask for a return receipt.

The documentation that accompanies @Mail is generally a joy, well above the standard for this class of application. For example, you are shown in enormous detail how to create an @Mail address book. The user guide expands on the address book concept with suggestions for creating distribution lists and assigning aliases.

Experienced e-mail users will notice a few glaring weaknesses. The lack of file folders means there are a limited num-

ber of things you can do with the e-mail you receive. Another helpful addition would be a master address book, one that can be stored on a network drive and accessed by all. As it stands, users have to create their own and they are limited to 400 addresses.

@Mail will run on all the popular networks, NetWare, LAN Manager, IBM's PC LAN, 3Com's 3+Open and 3+Share, and Banyan's VINES, but it requires Novell's Message Handling Service (MHS), Version 1.1 or later to operate. Since it is a native MHS app, exchanging

e-mail with other MHS-supporting applications is as easy as purchasing the appropriate MHS gateways and finding a savvy administrator to ensure the right connections.

@Mail is an e-mail program that will warm the hearts of spreadsheet lovers. It acts and feels like a natural extension of the Lotus interface. While it does not have a powerful appeal for those not already ensconced in 1-2-3 or Symphony, it will not isolate those who are, since it so easily connects to other e-mail servers.

FACT FILE



@Mail: Electronic Mail for Lotus 1-2-3 and Symphony Users
 Beyond Inc., 38 Sidney St.,
 Cambridge, MA 02139; 617-621-0095.
List Price: Starter kit (for one user with an administrative guide), \$129.95; additional node packs (eight users), \$395.
Requires: 640K RAM, MHS, Version 1.1 or later, Lotus 1-2-3, Version 2.01, 2.2, 2.3, or Lotus Symphony, Version 1.1, 1.2, 2.0, 2.2.
In Short: An easy-to-use add-in program to let you send e-mail directly from your Lotus 1-2-3 spreadsheet or Symphony files.

CIRCLE 446 ON READER SERVICE CARD

Close-Up 4.0: A Must-Have For Running Windows by Remote Control



Norton-Lambert wins the race to deliver the first remote-control software that works well with Windows. What's more, Close-Up, Version 4.0, makes it to the finish line in style with easy installation, an impressive feature set, and careful attention to detail.

Like most remote communications programs, Close-Up is really two separate products. Close-Up for the Customer/Terminal runs on the computer you want to call. Close-Up Sup-

port/ACS (ACS stands for Automated Communications System) is the remote support program, and usually manages the machine placing the call.

ACS uses task files, which are analogous to script files, to completely automate communications tasks. The two programs can be bought as a bundle or you can purchase one copy of Support/ACS and as many copies of Customer/Terminal as your needs dictate.

Though both Close-Up programs run in character mode, you can use them to run Windows on the Customer/Terminal

side, the Support/ACS side, or both. Unlike some other remote-control programs available now, Windows can be run in Enhanced, Standard, and Real modes, with full control over the mouse and the keyboard in each.

Using Close-Up you can run Windows applications, DOS applications full-screen, DOS applications under Windows, and combinations and multiples of these—all remote. Close-Up itself can also be run in a window.

Because Close-Up optimizes throughput to squeeze every ounce of performance from your modems, you can operate Windows remotely on the Customer/Terminal side without interminable waiting. Close-Up takes full advantage of the current crop of fast new

V.32/V.42/V.42bis modems.

When I tested a Windows connection with a pair of Hayes Ultra 96 modems to two 386/33 machines, the performance was far better than any other remote software. Loading Windows under the Close-Up connection, a Gateway 386/33 took less than 30 seconds (the same system requires 15 seconds to boot Windows from the keyboard).

That may sound slow to anyone who hasn't run software across a dial-up connection, but it's a major improvement. pcAnywhere running Windows is impossibly slow.

Speed may be your first attraction to Close-Up, but it's the attention to detail and ease of use that you'll come to appreciate. To begin with, the installa-

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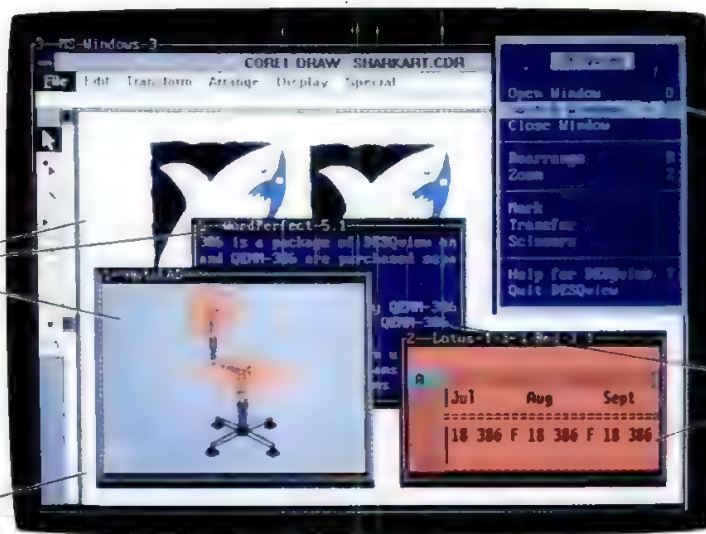
Better Windows

Solve memory problems
QEMM 386 makes the most of every last 'K'. DESQview uses that memory to run multiple programs.

Multitask
Run multiple programs side-by-side in windows. 'Background' programs can continue to run.

See text and graphics side-by-side
Reference information in your graphics program while writing your report.

Run Windows programs
DESQview even lets you run Microsoft Windows.



Easy menu access to programs and DOS services

Access programs or DOS in a window with just a few keystrokes or mouse clicks. It's that simple.

See multiple files
If your programs allow it, DESQview lets you run the same program in two or more windows. Great for comparing files.

Cut and paste data
Transfer data between programs with a few keystrokes.

Handle large programs
Run standard DOS programs side-by-side with DOS-extended programs like Lotus 1-2-3 Release 3.

DESQview. The Multitasking, Windowing Environment.

Once the power user's secret, DESQview has been discovered by computer knowledgeable people everywhere. Over 1,000,000 people have bought DESQview.

Multitasking; windowing, using keyboard or mouse commands, it's all easy with DESQview.

DESQview 386 2.3 lets you use your favorite DOS and DOS-extended programs in windows side-by-side on 386SX, 80386 and i486 PCs. As you can see above, you can even run Microsoft Windows



within DESQview.

DESQview 2.3 gives 8088, 8086 and 286 PCs with additional memory most of the same capabilities with surprisingly little performance trade-off.

Whatever programs you use—DOS, extended DOS or Windows—and whatever hardware you have, whether 8088 or i486 or something in between, DESQview is still the best way to get the most out of the hardware and software you own today.

DESQview. When you look into it, it's the obvious choice.

Quarterdeck

Quarterdeck Office Systems, 150 Pico Boulevard, Santa Monica, CA 90405 (213) 392-9851 Fax (213) 399-3802
CIRCLE 338 ON READER SERVICE CARD

First Looks

Close-Up

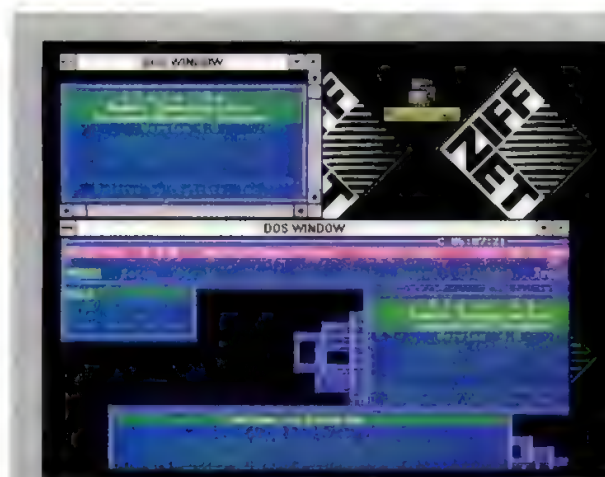
CONTINUED FROM PAGE 46

tion is easy: Each module comes on one disk as one file that you copy to a directory. Upon execution, you are prompted for all the setup information the program needs.

All program options are easily accessible through pull-down menus that require a minimal number of keystrokes or mouse clicks to use. And though we never found the need, you can fiddle with every aspect of the program, from the modem init strings to the hotkey combinations.

To completely automate your communications, you'll need to use *Close-Up*'s ACS commands. The task files you create with ACS commands can do anything you can do via the menus: send and receive files, enter keystrokes at a remote site, execute programs on a remote computer, and so on.

With a modicum of effort, for instance, you can put togeth-



Here two DOS windows, one running as the customer and one as support, are opened simultaneously. The support program can control the customer's mouse.

er a task file that will call a group of unattended, remote customer sites and patch an executable file on the customer's computer.

Other details make for more facile *Windows* operations. For example, when you run *Windows* on the customer side, your support side will have two mouse cursors. The traditional

cursor will update right along with the full graphics screen, while an outline of the mouse cursor will show you where the cursor really is on the customer's computer. It's a touch that the impatient can appreciate.

Finally, *Close-Up* is reliable. Every modem we tested invariably connected to every other, with optimum throughput

enabled. (These included modems from MultiTech, UDS/Motorola, and Hayes.)

Close-Up is not inexpensive. The Customer/Terminal program lists for \$195, while the Support/ACS side lists for \$245—a steep price for an occasional call to the office. But if you are involved with remote support that involves *Windows*, you need *Close-Up*. ■

FACT FILE

Close-Up, Version 4.0

Norton-Lambert Corp., P.O. Box 4085, Santa Barbara, CA 93140, 805-964-6767.

List Price: *Close-Up*

Support/ACS, \$245.

Customer/Terminal, \$195

Requires: Modem, DOS 2.0 or later, *Windows* 3.0 or later (optional), and memory (Customer/Terminal TSR requires 34K, Support/ACS, 153K).

In Short: Norton-Lambert's *Close-Up* is the very first dial-up remote-control program to give the user control over *Windows*.

CIRCLE 449 ON READER SERVICE CARD

DECpc 433: Fast Video Blurs the Distinction Between PC and Workstation

DESIGNED BY NATE ZATWICK

Digital Equipment Corp.'s original PC, the graphically proficient but hopelessly proprietary Rainbow, couldn't cut it in a burgeoning market where stan-

dards mattered.

DEC's brand-new fully compatible 486-based PC is an indicator of a wiser DEC. The DECpc 433 adds value to the existing standard without sacrificing compatibility.

What's more, this machine

shows strength in an area where DEC knows a thing or two—the graphics workstation market.

At \$5,999 for a diskless node configuration, this small-profile, 33-MHz 486-based machine is a PC designer's dream.

The machine is codesigned and manufactured by Intel. Its graphics system (see sidebar), designed around Texas Instruments TMS34020 graphics coprocessor, was built by Appian Technologies, makers of the Editors' Choice-winning Rendition II graphics adapter (see "1024 Graphics Adapters," April 10, 1990). Though that board has since been challenged by other coprocessing innovations and a price war, DEC's custom version of the board includes updates to an already excellent design.

The system boots into 1,280 by 1,024 pixels with 256 colors but is compatible with VESA-

standard 640-by-480 Super VGA drivers. Pixel interpolation doubles the effective resolution to 1,280 by 960 pixels with 256 colors, allowing a standard VGA image to fill more of the screen.

The graphics subsystem uses 2MB of video RAM. Though it comes without extra memory, either 4MB or 16MB of application-addressable dynamic RAM can be added.

The custom graphics board drives DEC's fixed-frequency 72-Hz 20-inch noninterlaced high-resolution monitors, but will drive an industry-standard 1,280-by-1,024 monitor. Optional 19-inch monochrome and 16- and 19-inch Trinitron monitors are also available from DEC. DEC chose fixed-frequency monitors, instead of industry-standard multiscanning (for high resolution), to keep costs down for a complete system.

High-resolution drivers shipped with the system include *Windows*, *AutoCAD* (Release



PHOTOGRAPHY: THOM O'CONNOR

File Edit Worksh

Share

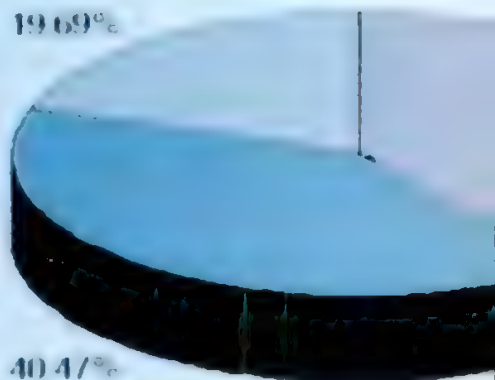
All

	A	B
9	Int	1200
10	Rent	1000
11	Adv	900



19.69%

40.47%



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Now, when you buy your new ZEOS
Windows system, you're going to
get more than you bargained for!



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1-2-3[®] for Windows

Now included in every



Your new ZEOS Windows system includes Microsoft Windows Version 3.0 plus a genuine Microsoft Mouse.

For a limited time only, ZEOS Windows systems buyers will also receive Lotus 1-2-3 for Windows plus Ami Pro 2.0, the Lotus Word Processing package for Windows. Complete and fully documented!



Unbelievable? Believe it! Because now, when you buy any new ZEOS Windows[®] system, you will also receive Lotus 1-2-3 for Windows plus Lotus' new word processor for Windows, *Ami Pro 2.0* at no additional charge!

It's the ultimate bundle! First, you're going to be receiving the incredible new ZEOS modular system complete with the upgradable CPU of your choice. These new ZEOS systems are the hottest computers money can buy. And that's just for starters.

Because you're also receiving the hottest software money can buy. Yet you don't have to buy it. Because we're including it at *no additional charge*. Go ahead and pinch yourself, it's really true!

And not only are you receiving the *amazing* new Lotus 1-2-3[®] for Windows and *Ami Pro 2.0*, you're also getting Microsoft[®] Windows itself, plus a genuine Microsoft Mouse plus Microsoft DOS 5.0. All included at one low package price.

These are not some scaled down versions or trial disks either. They are the *complete* and *fully documented* editions of Lotus 1-2-3 for Windows and Lotus *Ami Pro 2.0* for Windows provided to you by special arrangement between ZEOS and Lotus. This is one incredible value that no one else can offer. You're going to love it, too.

Because nothing else brings out the power of the most powerful software like your blazing new ZEOS system. And when you strap your-

plus AMI Pro 2.0!

ZEOS Windows System.

The foundation of your new ZEOS Windows system is the computer itself. You'll get an upgradable processor module, super-fast 53ns DRAM, a 300 Watt power supply, and lots of bays and slots for future expansion. The hardware simply can't be beat.



Wrap your Windows system up with the latest and greatest DOS version, Microsoft DOS 5.0! Fully featured and fully documented. You're going to love it!

self in and fire up *Windows* with Lotus *1-2-3* and *Ami Pro*, you're in for the ride of your life!

After all, nobody knows spreadsheets better than Lotus. And when they sat down to write *1-2-3 for Windows* they created a masterpiece. It starts out as a full-fledged *Windows* application. Offering that perfect balance of power and simplicity, it remains fully compatible with all the earlier versions of *1-2-3*. And it's absolutely loaded with new features.

Power, Simplicity, complete Compatibility *plus* loads of new features. It's Lotus *1-2-3 for Windows* and it comes with every ZEOS *Windows* system. And so does *Ami Pro 2.0*!

After all, *Ami Pro 2.0* is the Lotus word processing program that was designed for

Windows from the ground up. Linking with a full suite of *Windows* applications *including* your new Lotus *1-2-3 for Windows*, *Ami Pro 2.0* is perhaps the finest word processor on the market today.

Buying your new ZEOS *Windows* system is possibly the best purchase decision you'll ever make. Then add to it Lotus *1-2-3 for Windows*, *Ami Pro 2.0* plus *Windows 3.0*, *DOS 5.0* and a genuine Microsoft mouse. It's an offer that can't be beat and one we simply can't offer for long. So pick your new ZEOS *Windows* package now and we'll include a bundle! **Call now 800-423-5891!**

Upgradable. High Performance. Low Cost. And every ZEOS Windows system comes with Lotus 1-2-3 for Windows and Ami Pro 2.0 at no additional charge. Absolutely incredible!

With ZEOS 386-25s starting at only \$1395 right thru '486-33MHz systems starting at \$1795, computing will never be the same again! And it's not just the prices that make these new systems hot. It's Performance and Upgradability as well.

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When we first sat down to design these new systems, we wanted computers that would *blow the doors off* anything else out there. Plus, we wanted you to be able to upgrade from one CPU to another as your computing requirements changed, *without having to buy an entirely new system*. The results?

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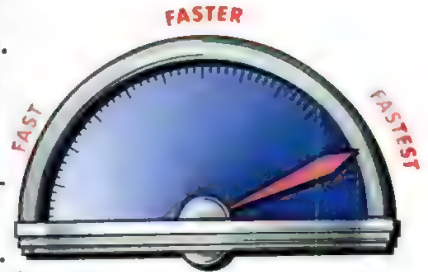
Upgradable.

Hot New ZEOS '386

know that as your computing requirements change, your processing power can change as well. But are the prices really that good?

Yes. *Absolutely Yes!* The prices really *are* that good, and the quality too. Because when you buy from ZEOS you're buying directly from the manufacturer.

Starting with the main system board, your new computer is designed and built by us right here in Minnesota. That saves money for you. And your ZEOS factory direct advantages are evident not only in the price, but in the performance and quality of your system too.



Z • SPEED METER

To help you select the processor option that's right for you, we have developed the Z-Meter. The Z-Meter shows you the relative performance gains achieved by moving from one processor module to another—fast, faster, fastest! No matter which system you select you can be sure of one thing—these babies are Hot!

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Harnessing the ZEOS power and value you want is easy. Pick your processor then your package. Package #1 gets you up and running for a very reasonable price. To add even more options *and*

savings select from Packages 2, 3 or 4.

Because when you select from Packages 2, 3 or 4 you receive VGA, additional memory, larger drives and more. You also receive *Windows 3.0* plus *Lotus 1-2-3 for Windows* plus *Lotus' great new Windows word processor Ami Pro 2.0*, plus *Microsoft DOS 5.0* plus a genuine Microsoft Mouse. Nobody

gives you this combination of hardware *and* software power. And it's yours, all for one low package price!

And that's just for starters. Because *inside* your new ZEOS system rests the very latest advancements in surface mount, high integration technology. As an example, we have freed two normally occupied expansion slots by placing our high speed IDE hard drive and

floppy drive interfaces right on the main board. Then, we put the high speed serial, parallel and game ports on the motherboard too. The result?

Eight expansion slots, *seven* of which are available for your future use! After all, expansion and non-obsolescence are what these great new ZEOS systems are all about. We've built in some other very important expansion features for you as well.

Like our *300 watt* power supply. Providing you with all the pure clean power you'll need right now, your ZEOS 300 watt supply also provides you with plenty of power for the future as well. Plenty of slots, plenty of power. How about space? This is where ZEOS has performed something akin to magic.

It's your new ZEOS SpaceSaver case! Complete with *seven drive bays*, this incredible case is actually *smaller* than many cases offering only five bays. We've also added a *second whisper quiet cooling fan*. Why? Because whether you expand your system or not, the cooler it

486-33 \$1795

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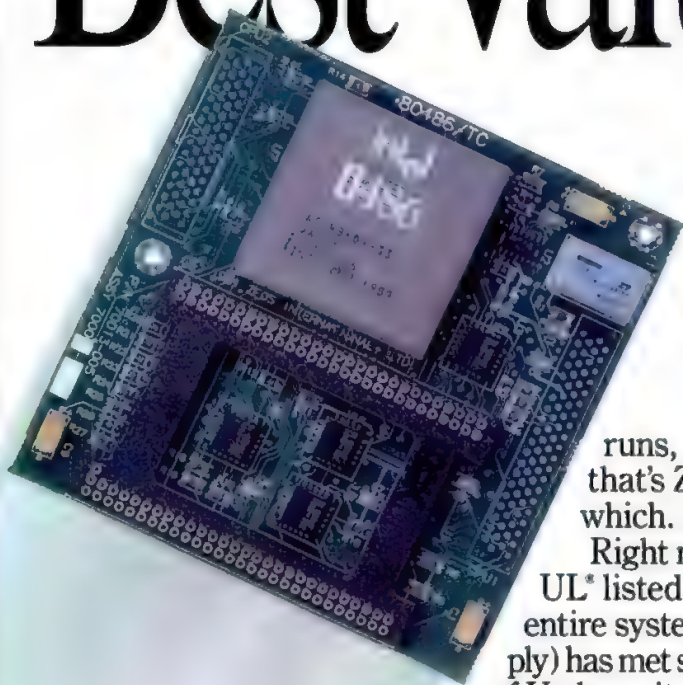
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runs, the longer it will last. Now that's ZEOS *value*. Speaking of which. How about UL® listings?

Right now every ZEOS system is UL® listed. This listing means your entire system (not just the power supply) has met stringent safety requirements of Underwriters Laboratories. We believe

UL® listings also say a lot about quality. And UL® safety listings are something many of our competitors simply don't (or can't) provide. At ZEOS quality and safety are important to us. *You* are important to us.

Price. Performance. Quality and Support.

There are *many* reasons to buy your new ZEOS upgradable system. Plus, your ZEOS advantages include *24 Hour a Day Toll Free* Technical Support, our 30 Day Money Back Guarantee and ironclad warranty, just to name a few (for more ZEOS advantages see the section entitled "*Why ZEOS is Your #1 Choice*").

Selecting the new ZEOS system that best fits your needs is easy. Choose from any of the money saving packages shown here. Or let your friendly and knowledgeable ZEOS Systems Consultant help you configure exactly what you want from our huge selection of upgrades and options. Whatever you select, one thing is for certain.

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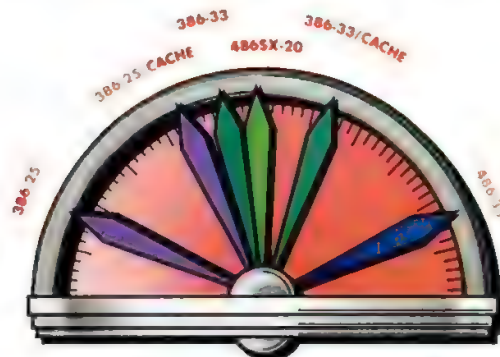
Or Let Us Custom Build to

Now, ZEOS lets you pick the power you want for the price you want to pay! Not only that, every ZEOS Windows System (Packages 2, 3 and 4) includes not only Microsoft *Windows*, *DOS* and a mouse — we're also including Lotus *1-2-3 for Windows* plus Lotus' new Windows word processor *Ami Pro 2.0*!

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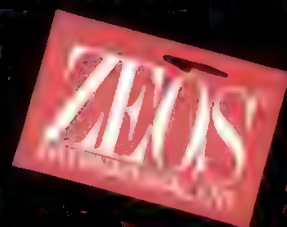
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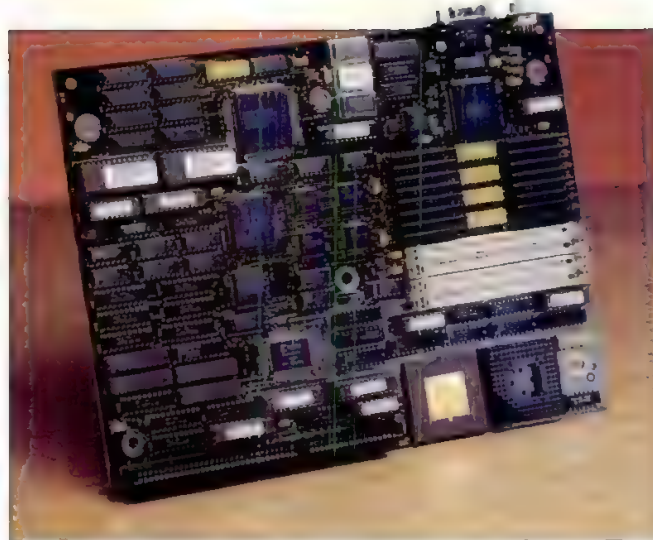
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10 and 11), Presentation Manager, PageMaker, and Ventura Publisher, among others.

The Intel-built motherboard holds a 486/33, a 487 coprocessor, an optional Intel 82485M Turbocache, 8MB of RAM (expandable to 48MB), an Ethernet adapter, two serial and one parallel port, a PS/2-style mouse port, one SCSI II connector, and an IDE floppy/hard disk controller. Intel's 64K 82485M cache boosts the unit's speed to 26 mips. The only basic component not on the motherboard is the video controller.

DEC builds in networking, too. The on-board Ethernet connector supports DEC's Pathworks network operating system (NOS), but is also Novell-certified and supports Banyan's VINES.

Pathworks is DEC's version of Microsoft's LAN Manager. The NOS is designed to be interoperable with Pathworks on other platforms including VAX, Unix-based systems, and the Mac. Support for Token-Ring through Proteon ProNet adapt-



Appian's graphic system uses a frame grabber to run standard VGA in 1,280 by 1,024 resolution on a fixed frequency monitor.

ers is rumored to be imminently available and TCP/IP compatibility is expected this fall.

DEC is currently shipping a 33-MHz 486-based tower unit to work as the OS/2-based Pathworks' server for the DECpc 433. The server, called the pc

433T, is designed by DEC and manufactured by Tandy.

In the PC Magazine Labs Windows performance tests, the graphics adapter speed was on a par with or better than the lower-resolution 1,024-by-768 boards we tested in our last

roundup (see "High Resolution and High Speed," June 25, 1991). The graphics system does well in the aligned and nonaligned BitBlt tests, surpassed only by the top contenders (including ATI's 8514/Ultra and Artist's XJS-1024). But the board absolutely smokes them all in its handling of dialog boxes and rectangular clipping refreshes at 1K resolution.

The DECpc 433 also placed near the top of the 33-MHz 486 class on PC Labs' benchmark tests (see "Maximum Performance," February 12, 1991, for benchmark tests), with times of 1.09 seconds on the Instruction Mix test, 1.81 seconds on the Floating-Point Calculation test, and 0.16 seconds on Conventional Memory read/writes.

There's a lot of power here, but not a lot of room for future expansion. Everything is packed tightly into the 2.75- by 14.5- by 16.5-inch box (HWD). To add storage, you need a \$450 look-alike SCSI-connected unit that holds two 5.25-inch devices. There is space in the basic box for one 3.5-inch device (either floppy or IDE hard disk). DEC offers a range of choices from 3.5-inch floppy disks to 105MB IDE hard disks to 320MB SCSI hard disks.

DEC plans to offer the DECpc 433 in discount bundle configurations, including drives, monitor, and expansion box, in the first quarter of 1992.

If graphics speed is important to you, give the DECpc 433 a long hard look. ■

THE DECpc 433'S SMART GRAPHICS ADAPTER

At the heart of the DECpc 433 graphics workstation is Appian Technologies' video subsystem. To create a high-end graphics station that was still firmly a part of the PC family, DEC needed a system that was both fast and compatible.

What complicated the issue even further was DEC's need to keep costs down. The graphics system had to be able to drive DEC's standard high-resolution single-frequency monitor in several video modes. Ordinarily, to run software in several different modes, companies use a costlier multiscanning monitor.

Appian's fix was to put the multiscanning in the board itself, in the form of a frame grabber called the "VGA Grabber." This adapter feeds data to the monitor in the appropriate mode for the application. In

high-resolution mode, the data is fed directly to Texas Instrument's 34020 GSP (graphics system processor) allowing for a 25-frames-per-second rate.

In VGA mode, the pixel data is sent to the GSP through FIFO (first in, first out) memory blocks. The GSP takes each image on a frame-by-frame basis, zips it through a VRAM-based frame buffer, and then to the DAC (digital-analog converter) where it is converted to the red, green, and blue signals for the monitor. This route eliminates timing problems that required multiscanning to display in several modes, eliminates the need to go to the video BIOS for driver information, and allows for real-time display.

To keep the image size constant on-screen in all modes, Appian added pixel and line doubling, allowing

the DECpc 433 to display 640-by-480 VGA in a larger viewing area. VGA compatibility allows standard drivers to run in this mode, ensuring compatibility with most applications.

Texas Instruments' new 32-MHz, 32-bit TMS34020 graphics coprocessor is reportedly 20 times faster than its predecessor, the TMS-34010. Appian has recently released a general-market TMS34020-based graphics adapter, the \$2,395 Rendition III, that is virtually identical to the DEC workstation's graphics system—without the VGA Grabber. Appian plans to make the VGA Grabber a commercially available option in the near future.

Appian Technologies is located in Bellvue, Washington, and can be reached at 800-422-7369 or 206-649-8086.—NZ



FACT FILE

DECpc 433

Digital Equipment Corp., Personal Computing Systems Group, 305 Foster St., Littleton, MA 01460, 800-343-4040

List Price: DECpc 433, \$5,999 (diskless node), DEC 20-inch 1,280-by-1,024 monitor, \$1,995; Eclipse expansion box, \$450

In Short: A 486-based network workstation with lightning-fast 1,280 by 1,024 graphics. It's built to compete with the speed and resolutions of Unix-based workstations, but fully compatible with PC standards.

CIRCLE 706 ON READER SERVICE CARD

First Looks

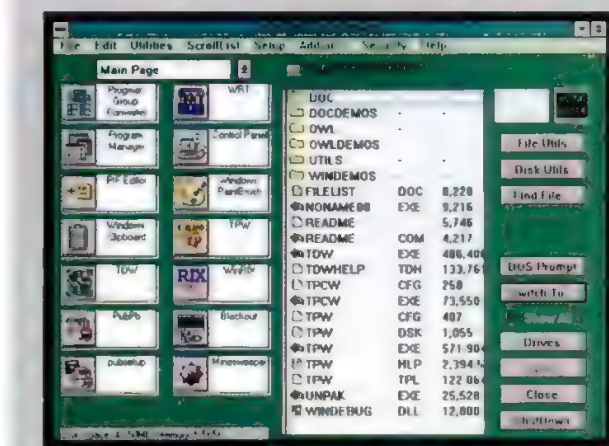
\$180 Salvation Manages Windows With Handsome Push-Button Controls

HANDS ON
by Barry Simon

The Norton Desktop for Windows (First Looks, September 24, 1991) is a chunky program with incredible functionality, object manipulation, and pull-down menus. Those with fewer needs will find Vitesse's \$179.95 *Salvation* less overwhelming but expensive.

Salvation, a *Windows* shell, replaces both *ProgMan* and *FileMan* with a handsome button-based interface that launches programs as icons do in *Program Manager*. You can also specify a start-up directory distinct from the program directory, and you can set up a prompt for additional parameters each time you launch.

You can have multiple button pages and choose one from a drop-down list. Buttons can be set up to jump to other buttons. Dialog boxes create button



Salvation replaces *Windows*' *Program Manager* with push buttons.

pages and turn blank buttons into launchers.

The main screen has three sections: a set of launching buttons, a scrollable file list, and

action buttons. Rather than *Program Manager*'s groups, *Salvation* uses a page of launch buttons. The number of buttons on a page depends on monitor reso-

lution—14 on a standard VGA. The scrolling list can also launch programs or obtain information on a highlighted file.

Buttons and icons on the right side of the screen are specialized. A clock sets an alarm. Other buttons call up the Task List or a DOS prompt. A Disk Utils button displays total and free space on each drive and allows you to format floppy disks. A File Utils button divides the screen in two and allows you to copy, move, delete, and compare files.

Salvation also has a library of icons to attach to buttons, a text editor with single-level undo, and a microlaunch—a minimalist *Program Manager* replacement.

Salvation is pricey and pretty; it will appeal to those who like the idea of a graphical interface but want a more predictable setup than *Windows* and a less taxing one than *The Norton Desktop for Windows*.

List Price: *Salvation*, Version 1.0, \$179.95. **Requires:** 1MB RAM free with *Windows* loaded, *Windows* 3.0. Vitesse Inc., P.O. Box 929, La Puente, CA 91747-0929; 800-777-7344.

CIRCLE 702 ON READER SERVICE CARD

Too Many Icons? Hire a Librarian

HANDS ON
by Barry Simon

Like any collection, an icon collection can become unmanageable. *Icon Manager*, Version 1.2, a \$24.95 shareware program from Impact Software, lets you store icons as individual icon files or archive them in libraries that *Windows*' *Program Manager* can understand; in addition, you can save disk space by keeping the icons in compressed libraries.

The program displays its libraries in multiple windows, called sheets. Icon files in a directory, an .EXE file, or a DLL file can all be read into a sheet. Up to 30 sheets can be viewed and manipulated simultaneously using the MDI interface.

To move an icon from one sheet to another you drag it and then drop it. A push button in the program's toolbar deter-

mines whether dragging the icon copies or moves it.

The program can't edit icons, but it can make parts of an icon transparent, or inverse the attributes. A camera tool turns any 32-by-32 pixel area into an icon, and a collection of 250-plus icons come included with the program.

High on my wish list for enhancements would be the ability to assign keywords to icons and be able to search on them.

To fuel your icon mania, *Icon Manager* and a free collection of over 3,000 icons are available for downloading from PC MagNet's UtilForum (Library 10).

List Price: *Icon Manager*, Version 1.2, \$24.95. **Requires:** *Windows* 3.0. Impact Software, 12140 Central Ave., #133, Chino, CA 91710; 714-590-8522.

CIRCLE 701 ON READER SERVICE CARD

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Silly Little Icons: Volume I (140-plus icons), \$27.95; Volume II (180-plus icons), \$34.95; for both volumes bundled, \$48.95. Dunn Enterprises, 4 Prospect Terrace, Gorham, NH 03581; 603-466-5234.

Icons 300+: Includes a microlaunch application, \$79.95. Vitesse Inc., 13909 Amar Rd., La Puente CA 91747; 818-813-1270.

Icon Pak I and II, Volume I

(100-plus icons), \$49.95; Volume II (400-plus icons), \$99.95. This package uses a 64 by 64 mask rather than the more-standard 32 by 32 for richer-looking icons. Software Workshop, 75 S. Mountain Way, Orem, UT 84058; 800-762-9550.

On PC MagNet's UtilForum, Library 10, you'll discover a free collection of over 3,000 icons put together by Russell Mueller. Some of these icons aren't really very good, but the best ones are comparable with current commercial packages. You'll need to sift through these with an artful eye.—BS

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CIRCLE 313 ON READER SERVICE CARD

First Looks

How to Have a Cartridge With Just the Fonts You Want

HANDS ON
by Edward Mendelson

If you've ever struggled with LaserJet soft fonts, you've probably dreamed of buying a font cartridge that contains all the fonts you want and none that you don't want. Pacific Data Product's \$299 FontBank Cartridge is the product you dreamed about.

If you own a Hewlett-Packard LaserJet II, IIP, III, or IIIP, you can build a unique, personalized font cartridge using the soft fonts you already have on your hard disk. The FontBank Cartridge can store any soft font that you can use with your printer. Both the LaserJet II and III series can use bitmapped PCL 4 fonts; the LaserJet III lets you use both PCL 4 and scalable PCL 5 fonts.

Unlike every other font cartridge, the FontBank comes with no fonts built in. You don't get the Times and Helvetica you get with almost every other cartridge, but you also don't have to waste cartridge space on them if you don't want them. The FontBank Cartridge's installation software shows you a list of LaserJet soft fonts you already

have currently installed in *WordPerfect*, *Microsoft Word 5.x*, or *Microsoft Windows 3.0*. You select the ones you use most often, and the software downloads them semipermanently into the cartridge's 750K of Intel Flash RAM.

When you have finished installing all the fonts, you pull the cartridge from the printer, flick a switch hidden just above the connector, plug it back in, and use it like you would any other font cartridge. Now, instead of waiting while your application downloads soft fonts, you can see pages appear almost instantly. And if you decide you want to install a different set of fonts later on, you simply load the new set into the cartridge exactly as you loaded the first set.

If you dreamed of a cartridge like this, however, you probably dreamed of getting one with greater capacity. The FontBank can typically hold about eight PCL 5 scalable fonts and about eight PCL 4 fonts in ordinary text sizes. This is plenty for business use, where you want a consistent and limited set of fonts, but not enough for casual experiments in design.

You can't increase the ca-

capacity of the cartridges by compressing fonts, since the installation software expands the fonts to normal size before the cartridge can store them. Cartridges with a larger capacity will probably arrive only when the price of Flash RAM drops well below current levels.

Choose fonts carefully before installing, because each install takes as much as 10 minutes. You can load the same font selection into more than one cartridge, but each repeated installation needs almost as much time as the first—a serious problem in corporate settings with dozens of printers.

Don't even think about installing before studying the manual. If you have a LaserJet III with more than 1MB of RAM, the installation software won't recognize the cartridge unless you turn off the printer's Page Protection from the printer control panel. You can use the cartridge for printing with any HP LaserJet II or III model, but you can't install fonts into the cartridge with the LaserJet IIISi. And Pacific Data doesn't claim compatibility with any non-HP printer.

The installation software lets you work only with the fonts that are currently installed in one application. You can't simply start from your font directory and load fonts that aren't already installed in *WordPerfect*, *Word*, or *Windows*. You can use exactly the same fonts in *WordPerfect* and *Word*, but it isn't practical to use the same cartridge with these DOS applications and with *Windows*, because *Windows* uses a different character set.

You can, of course, install *Windows* and DOS fonts in two different cartridges and put one in each slot of a two-slot HP LaserJet printer. And you can continue to use disk-based soft fonts together with the fonts in the FontBank Cartridge.

A programmable cartridge like this one has the obvious potential to print LaserJet macros like preprinted forms. If you're really an expert in PCL, you can use the undocumented /MACRO parameter with the installation software and store macros in the FontBank Cartridge, but



Pacific Data doesn't actively support this option. Future versions of the installation software may make macros easier to manage.

If you already use a mixture of cartridges and soft fonts, you may want to use FontBank as a substitute for your existing cartridge, but you'll need to find soft font equivalents of your existing cartridge fonts first. Bitstream's *Fontware* and HP's *Type Director* are two possible sources, and you can buy soft font equivalents of the fonts in HP's A-Z cartridges either in IQ Engineering's well-drawn \$39 *Supplementary Fonts for the SuperCartridge* (800-765-3668) or Good Software's \$129.25 in *I SoficCartridge* (800-925-5700).

FontBank isn't for everyone. You have to make your own font selections, and you have to work your way through a slow and painstaking installation. But if you know exactly which fonts you use most often, and already have them on-disk, FontBank can save you time and headaches every time you print.



FontBank's installation software lets you choose fonts from those already installed in your applications. The menu isn't clear, but the manual makes sense of it all.

FACT FILE



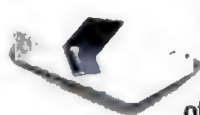
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To find out more, contact: Mega Drive Systems, 489 S. Robertson Blvd., Beverly Hills, CA 90211, Phone 213-556-1663 • Fax 213-556-1164, or

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MTBF (BEST)	150K+	60K	60K
CAPACITIES AVAILABLE	52-535Mb	20-90Mb	21-42Mb
MAXIMUM ON-LINE	3,745Mb	1,260Mb	85Mb
PC AND PS/2 COMPATIBLE	Yes	Yes	Yes
MACINTOSH COMPATIBLE	Yes	Yes	No
WORKSTATION COMPATIBLE	Yes	No	No

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MOTOROLA

Microprocessor and Memory Technologies Group

First Looks

NetRoom 2.0: Room at the Top, Even for Windows Users



When we reviewed DOS 5.0 (First Looks, July 1991), we questioned how its introduction would affect the future role of third-party memory managers. Helix Software's newest release of *NetRoom*, the \$79 Version 2.0, provides an answer by concentrating on freeing more memory, even when your system is running *Windows* in Enhanced mode, and by automating the loading of TSRs and drivers into upper memory.

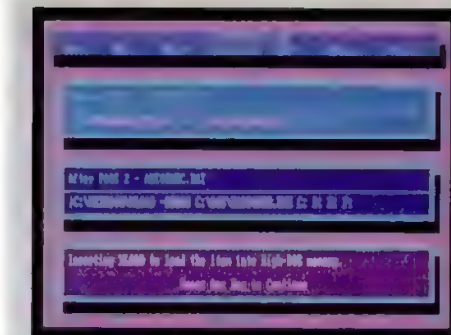
Helix has upgraded the Netswap portion of its program so that it can now have its virtual machine manager running at the same time as *Windows*' virtual memory manager. Netswap creates two virtual machines (or emulates them on systems with processors lower than a 386SX). One is designed to handle TSRs and drivers; in particular, network drivers. The other remains free for running applications—even *Windows* in Enhanced mode. Machines with LIM 4.0 expanded memory adapters or with a 386 or 486 processor gain up to 576K of additional memory.

As drivers and TSRs are needed they are swapped into

conventional memory and an application is swapped out, even if you are running *Windows* in Enhanced mode. Virtual machine swapping occurs automatically and fast enough that application processing slows little, except during heavy network access.

Customize, a new auto-configuration utility in *NetRoom*'s Discover system-analysis module, introduces the assistance found in *QEMM*'s Optimize and 386MAX's Maximize. The program reads your CONFIG, AUTOEXEC, and subsidiary batch files and attempts to find the best combination of device drivers and TSRs to move from conventional memory into High DOS, the HMA, or both. On 286s with the Chips and Technologies' NEAT chip set, Customize automatically loads and configures the *NetRoom* memory manager, RAM-MAN/386—which allocates either EMS- or XMS-compliant memory upon request.

In addition, the routine performs tasks such as lowering FILES and BUFFERS to a minimum in CONFIG.SYS, and then raising them again after they have been loaded high. One particularly illuminating option lets you step through the



The Customize routine sizes up your AUTOEXEC, CONFIG, and other batch files to determine what belongs in upper memory.

process of loading high. It displays the current line of your file, shows you how it will look once it has been modified with the Customize routine, and offers a succinct explanation.

Customize was able to deal with all the curves we threw it with a few minor exceptions. We encountered a bug when attempting to load COMMAND.COM high on our Compaq 386/25 running DOS 4.01; the problem stemmed from a bug in the DOS SHELL statement in DOS 3.x and versions of 4.01 descended from 3.1. Helix created a workaround solution in less than a day; they provide an update free to registered users.

Customize makes no attempt to change the loading order of TSRs or drivers; knowledgeable users can manually reorder things to free up additional conventional memory. Customize also leaves using and setting up its Netswap facility to you.

Other enhancements are sprinkled throughout the release. DEVLOAD.COM, which loads drivers from the command line (or a batch file), adds support for block devices. XLOAD, the High-DOS loader, now works with COMMAND.COM from DOS 3.x and later versions. RAM-MAN/386 now has an auto-switch that causes it to create High DOS on its own rather than requiring you to specify locations. Pooling XMS and EMS into an undifferentiated memory pool helped the original *NetRoom* earn its reputation as a memory miser; this new version pools XMS and EMS handles as well as memory, allocating on demand.

Helix has also built tight

DOS 5.0 integration into *NetRoom*. You can access DOS 5.0 help via the DOS /? command right inside the Discover utility.

As part of our testing, we threw the latest *Super PC-Kwik* disk cache at *NetRoom*, configured to run in conventional memory, along with the cache in expanded memory on our Compaq. Customize whipped this complex program into High DOS without a hitch and actually improved its performance according to the PC Labs disk speed benchmark tests. By contrast, the same configuration using 386MAX 5.0 held the cache back somewhat.

NetRoom carved its niche by breaking the 640K barrier for network users; Version 2.0 carries on the tradition, only now *Windows* users aren't left out. ■

QEMM 6.0: Late Beta Touts Cleaner Way to Gain Memory

386 memory managers provide a way to load drivers and resident utilities without taking available memory away from applications. Traditionally, this is done by using the address space between 640K and the 1MB boundary not used by video, ROMs, and adapter RAM.

Netroom goes beyond this with its virtual machine capability. Quarterdeck Of-

fice System's *QEMM* 6.0, which we saw in beta, and which should be released by the time you read this, is different from *Netroom* because it remaps ROM to EMS and uses the old ROM addresses for driver loading.

QEMM 6.0 provides less additional space, but Quarterdeck claims that its method is cleaner than Helix Software's—Barry Simon



FACT FILE

NetRoom, Version 2.0

Helix Software Co. Inc., 47-09 30th St., Long Island City, NY 11101; 718-392-3100.

List Price: Single user, \$79; 4 users, \$149; 10 users, \$249.

Requires: 640K and some extended (where appropriate) or expanded memory (LIM 4.0 recommended), DOS 3.3 or later (Support of all *NetRoom* features requires at least 64K of extended and expanded memory or a 386-based machine with at least 1MB RAM.)

In Short: Version 2.0 of this popular memory manager can take advantage of expanded memory even when running *Windows* in Enhanced mode; it loads drivers and TSRs into upper memory automatically, and is integrated with DOS 5.0.

CIRCLE 706 ON READER SERVICE CARD



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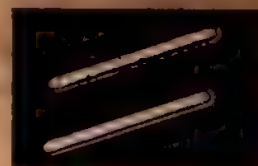


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THE GOLD STANDARD

First Looks

Total Control: Modem Management for Networks That Can't Afford a Bad Connection

HANDS ON!
by Steve Wagner

If you need more than three or four modems in your communications system, it makes sense to house, monitor, and control them in what's called a "modem pool." If your business requires that these lines are available constantly, you need a network management system to control and evaluate the quality of your long-distance lines and to closely monitor the activity of your communications devices.

U.S. Robotics' Total Control: Modem Management System combines a modem pool—in this case, a cabinet containing up to 32 modems—with a modem management system that combines monitoring, quality control, and alarm functions, plus the power to configure the modems from one central PC.

It competes in both price and performance with existing products from Racal-Vadic and UDS. The system is ideal for use with access servers like the J&L Chatterbox, PCs running WAITS (wide-area information transfer systems) software, asynchronous communication servers, and BBSs.

The Total Control system is comprised of three basic components: the special chassis with its management unit, the modems, and the *Total Control PC* software. The total for such a system runs about \$20,000 for a 16-unit modem pool.

The Total Control Chassis, at \$2,295, has 16 modem slots, a display panel, a rack controller for tracking the modem configurations, and a single power supply, all in an enclosed temperature-controlled environment. As many as 32 Total Control Chassis can be daisy-chained for a maximum number of 512 modems.

The Rack Controller Unit (RCU) within the chassis is a board that uses an Intel 80186 CPU to carry out all the func-

tions needed to manage an individual Total Control (TC) rack. The RCU controls the status of the modems, stores the modem configuration in battery-backed memory for as long as 30 days without power, tests and resets modems in case of failure, and activates spare modems or phone lines as required.

A device called the Control Interface Unit (CIU), also located within the chassis, provides ports for the RCU, the PC running the management software, and for interconnections to other TC chassis.

The second component of the system is the Total Control modems. U.S. Robotics offers three modems that can be chassis-mounted: The Total Control V.32bis rack modem (\$1,295), the Total Control HST rack modem (\$1,295), and the Total Control Dual Standard rack modem with support for both V.32bis and HST (\$1,595). Due out in December is the \$1,495 Total Control 2400e/2 that puts two 2,400-bit-per-second modems on each card so

you can put as many as 32 modems in a single TC Chassis.

Each modem has 11 LED lights to provide a quick visual indication of the health of the communications system. A separate front panel LED on the chassis warns of problems like a modem removed from service by the management module.

The third component, *Total Control PC*, is the PC-based software that monitors the modem pool. Priced at \$5,000, it uses a graphical interface complete with pull-down menus. Because the intelligence of the TC system is in the chassis, the PC running it does not have to be dedicated, and in fact, it doesn't have to be active for the management module to gather data and take corrective actions.

The functions of the *TC PC* software include configuring the management module, monitoring the network, testing components, providing problem diagnosis and response, and generating reports showing modem status and line errors.

We used the Total Control



FACT FILE

Total Control: Modem Management System
U.S. Robotics Inc., 8100 N. McCormick Blvd., Skokie, IL 60076-2920; 800-342-5877.
List Price: Total Control Chassis, \$2,295; Total Control PC software, \$5,000; Total Control V.32bis rack modem, \$1,295; Total Control HST rack modem, \$1,295; Total Control Dual Standard rack modem, \$1,595.

In Short: U.S. Robotics' Total Control system offers a capable modem pool plus a management solution. The three-part system allows you to manage and monitor the modem pool as well as the incoming and outgoing telephone lines.

CIRCLE 450 ON READER SERVICE CARD

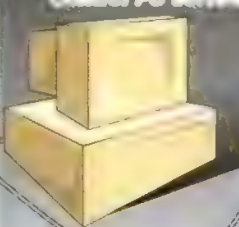
system with a group of PCs acting as access servers running DCA's *Crosstalk R2Host* software. Although we didn't have any malfunctions that needed the full management power of the software, the program made it easy to spot noisy telephone lines and intransigent calling modems that refused to connect at optimal rates.

In all, the Total Control System offers a powerful tool to monitor and control telephone connections. ■



U.S. ROBOTICS' TOTAL CONTROL: MODEM MANAGEMENT SYSTEM

U.S. Robotics' Total Control system is a dial modem management system that lets you centrally access and control as many as 512 modems from a single point. The system incorporates three components: the *Total Control PC* software, the Total Control Chassis, which houses the management unit, and a variety of Total Control high- and medium-speed modems. It is ideally used with file access servers such as the J&L Chatterbox. The system can be programmed to test modems, busy out phone lines, and reroute a modem or phone line if either one fails.



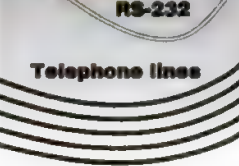
PC running Total Control PC software



Modem pool



J&L Chatterbox



Telephone lines



RS-232



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Computer Buyers Guide & Handbook • July '91, REAL-WORLD BENCHMARK Tests, pp 72-74. The Iverson 286/12 voted the BEST BUY! "Its performance was excellent, even outrunning some 386SX systems we tested this month. [It] was typical of the Iversons we've encountered in its overall high quality of construction and glitch-free operation."

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Computer Shopper • July '91 • Iverson 486/25: In operation, Iverson's 486 ran flawlessly [with] good all-around performance.



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by
Nate Zelnick

New & Improved

News of Announced Products and Upgrades

Bell Ships First AM386 SX/25-Based Computer

NEW Bell Computer has begun shipment of the first PC based on AMD's 25-MHz 386SX chip. Both AMD and Bell claim full compatibility with and faster performance than machines using Intel's 386SX.

The ISA-based 325SXT is aggressively priced at \$1,995. Standard configuration includes 2MB of RAM, a 512K VGA board, a 1,024-by-768 Super VGA monitor, a 105MB hard disk, and 1.2MB and 1.44MB floppy disks. It has 6 expansion slots, 1 parallel and 2 serial ports. Like the Intel 386SX series, the AM386SX can support up to 16MB of RAM.

A Microsoft-compatible mouse, DOS 5.0, and Windows 3.0 are bundled with the system. **List Price:** Bell 325SXT, \$1,995. Bell Computer Inc., 6615 Valjean Ave., Van Nuys, CA 91406; 800-922-1126, 818-909-3501.

CIRCLE 431 ON READER SERVICE CARD



Bell's 325SXT, the first machine to use AMD's 25-MHz 386SX, offers a complete system for \$1,995.

Mathematica Comes to Windows, Brings Its Own Notebook

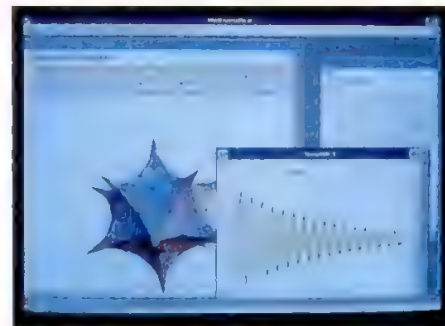
IMPROVED Wolfram Research has revamped the computational engine in *Mathematica* in bringing the DOS program to Windows. A notebook interface is at the heart

of *Mathematica* 2.0 for Windows.

The notebook interface lets you do free-form numeric, symbolic, and graphical computations.

The new Windows version adds 283 functions, and uses the same programming language and menu structure as *Mathematica* on Macs, NeXT machines, and Sun workstations.

The number-crunching kernel has been tailored for more than 20 platforms. Programs written in *Mathematica*'s programming language can be ported to all platforms.



Mathematica 2.0 for Windows' interactive notebook interface is file-compatible with other platforms.

List Price: *Mathematica* 2.0 for Windows, \$995; upgrade for owners of Version 1.2, \$125. **Requires:** 4MB RAM, Windows 3.0. Wolfram Research Inc., 100 Trade Center Dr., Champaign, IL 61820; 800-441-6284, 217-398-0700.

CIRCLE 433 ON READER SERVICE CARD

VENTURA 4.0 PROVIDES ALL PREPRESS FUNCTIONS

Ventura Software will release its long-awaited 24-bit color version of *Ventura Publisher* 4.0 for Windows in early October. The company claims this version will provide all prepress functions, creating four-color files that can generate final pages on virtually any professional printing system. Version 4.0 will support RGB, CMYK, CMY, HLS, Focal-Tone, and Pantone color separation models. Hooks to four new color-enhancing DLLs (dynamic link libraries), called Ventura color extensions, have also been announced.

The new extensions are: *Ventura Scan*, an integrated scanning package that lets you use a scanner while running *Ventura Publisher*; *Ventura Separator*, a full-page color separator; *Ventura PhotoTouch*, an image editor/retoucher; and *Ventura ColorPro*, a high-end tool to independently manipulate process colors.

Ventura has also added several features that smooth the program's interaction with Windows, including support for DDE and OLE, an 88,000-word spell-checking dictionary, an undo/redo feature, search-and-replace functions, a filter for *Word* for Windows files, and irregular text wrapping.

List Price: *Ventura Publisher* 4.0 for Windows, \$795; *Ventura Scan*, \$395; *Ventura Separator*, \$495; *Ventura PhotoTouch*, \$795; *Ventura ColorPro*, \$3,995. **Requires:** 386-based PC or better, 4MB RAM, Windows; math coprocessor recommended. Ventura Software Inc., 15175 Innovation Dr., San Diego, CA 92128; 800-822-8221, 619-673-0172.

CIRCLE 430 ON READER SERVICE CARD



Ventura 4.0 supports different color separation schemes, including CMYK, RGB, and Pantone standards.

NEC Offers UltraLite With Cellular Modem

NEW Combining two products, NEC Technologies is now offering the UltraLite Cellular Workstation. The portable PC comes with either an UltraLite 286 or UltraLite 386SX/20. The laptop is integrated with NEC America's P200/300 Series portable phone, UltraLite Image Modem Plus, and the Intelligent Cellular Interface. The portable is contained in a leather attache case.

The 2,400/9,600 data/fax modem will operate within any cellular net, according to NEC. Total weight for the package, depending on model, is 20 pounds.

List Price: UltraLite SX20, \$5,999; UltraLite
CONTINUES ON PAGE 62

New & Improved

BRIEFS



ADD-INS

Intex Solutions has added four new graphs, month- or week-based historical analysis, and new cost and unit scheduling methods to *Inventory Analyst* (\$250; upgrade, \$50). The *Lotus 1-2-3* add-in now offers bar graphs based on projected shipments, product availability, and schedule quantities, and a line graph based on a 12-month planning horizon. 617-449-6222.

Great American Software has announced *Get Paid Plus* (\$129.95). The collection of mail-mergeable collection, credit, and business letters integrates with Great American's *One-Write Plus* accounting system. The company also announced *DataSave* (\$39.95), an automatic file-backup utility for *One-Write Plus*. 603-889-5400.

MicroBliz, a leader in retail-store inventory control, has added in-counter, desktop scanning support to its *Clipper*-based store management system. 914-425-9000.

AccuSoft Corp. has added more than 40 features to *AccuDraw* (\$195; upgrade, \$49.95), its integrated *WordPerfect* drawing package. New features include bitmap support, a pixel editor, CGM and .PCX file export, and support for *WordPerfect*'s extended character set. Full-screen drawing and editing, ruler-scale measurement for CAD functions, and bold and italic fonts have also been added. 508-898-2770.

Editor's Choice Software is shipping *Hot Tips!* for *WordPerfect* (\$27.95). The on-screen templates for *WordPerfect* 5.1 and *Microsoft Word* 5.5 offer quick access to function-key shortcuts, as well as tips and command examples, all through an 18K TSR. 800-641-1116, 206-243-7496.

Lotus Development Corp. has announced a collection of clip art licensed from New Vision Technologies. The \$299 package, called *SmartPic's*, contains images in CGM or .DRW format and is optimized for *Lotus 1-2-3*, *Ami Pro*, and *Symphony*. A *Windows* browser for the package will be available in the fall. 800-635-6887, 617-577-8500.

CONTINUES ON PAGE 64

CONTINUED FROM PAGE 61

246, \$3,999. NEC Technologies Inc., 1414 Massachusetts Ave., Boxborough, MA 01719; 508-264-8000.

CIRCLE 432 ON READER SERVICE CARD

ALR Ships Low-Cost 486 Line

NEW Advanced Logic Research has announced a new line of low-cost and low-profile EISA-based 486 machines, which includes 20-, 25-, and 33-MHz machines. A 50-MHz version is due in the fourth quarter.

Retail prices start at \$3,694 for the 20-MHz; without a Super VGA monitor, DOS 5.0, *Windows*, and 80MB hard disk, it costs \$2,000. The basic configuration includes 1MB of RAM, expandable to 33MB, and a 1.44MB floppy disk.

List Price: ALR Model 80 Series: 20 MHz, \$1,995; 25 MHz, \$3,495; 33 MHz, \$3,795; 50 MHz, \$4,995. Advanced Logic Research Inc., 9401 Jeronimo, Irvine, CA 92718; 714-581-6770.

CIRCLE 434 ON READER SERVICE CARD

New Display Panel Choices Include a \$6,995 Thin-Film LCD

NEW The three leading manufacturers of flat-panel displays for presentations have all introduced new models.

nVIEW has unveiled two TFT (thin-film transistor) active-matrix LCD panels that can generate up to 32,000 colors. The Viewframe SpectraPlus, which is the second generation of nVIEW's Spectra line, displays 640- by 480-pixel resolution, weighs seven pounds, and accepts video input from PCs and Macs.

MediaPro, nVIEW's panel designed for multimedia presentations, uses a proprietary switching system to accept input simultaneously from four input devices. These can include PCs, Macs, laserdisk, VCRs, RGB, and television signals. MediaPro supports NTSC, PAL, and SECAM video standards. A modular connector attaches the devices, including the controlling computer, to the panel.

Meanwhile, **In Focus Systems** has announced a low-cost 5.9-pound 16-color VGA LCD panel. The triple supertwist nematic (TSTN) panel retails for \$2,695 and uses In Focus' SaBRE technique for color with two panels.

Proxima's new active-matrix panel will be reviewed in an upcoming issue.

List Price: SpectraPlus, \$6,995; Media Pro, \$9,995; upgrade from Spectra to SpectraPlus, \$1,295; to MediaPro, \$4,995. **Requires:** Overhead projector with control kit, \$189. nVIEW Corp., 11835 Canon Blvd., Newport News, VA 23606; 800-736-8439; 804-873-1354.

CIRCLE 436 ON READER SERVICE CARD

List Price: In Focus 1600, \$2,695. **Requires:** Overhead projector. In Focus Systems, 7770 SW Mohawk St., Tualatin, OR 97062; 800-327-7231, 503-692-4968.

CIRCLE 438 ON READER SERVICE CARD

First Programmable Monitor Lets You Pick Eight Settings

NEW ViewSonic is shipping a 17-inch non-interlaced monitor capable of resolutions up to 1,280 by 1,024. The ViewSonic 7 has 16 programmable modes, 8 of which are user-configurable, and it automatically adjusts to vertical frequencies between 50 to 90 Hz with auto-tracking and multiscanning.

The low-radiation monitor uses its own microprocessor to store and configure the size and position of on-screen images, features digital controls on the front panel, and has a dark-tinted silica nonglare screen.

ViewSonic 7 supports XGA, 8514/A, VGA, and SVGA graphics standards.

List Price: ViewSonic 7, \$1,999. **Requires:** Graphics adapter. ViewSonic, 12130 Mora Dr., Santa Fe Springs, CA 90670; 800-888-8583, 213-946-0711.

CIRCLE 437 ON READER SERVICE CARD

PC-File Gets New Look, Integrated Utilities

IMPROVED ButtonWare's *PC-File* has added a character-based CUA (common-user access) interface to its flat-file database. Version 6.0 reduces keyboard input with mouse support, pull-down menus, record-mode macro building, and condensed index and database creation routines.

Additional changes include an integrated file-find utility that searches disks, access to secondary programs from a pull-down menu, an editable table mode, improved help, and quick label support.

List Price: *PC-File*, Version 6.0, \$149. **Requires:** 450K RAM, DOS 3.0 or later. ButtonWare, P.O. Box 96058, Bellevue, WA 98009; 800-528-8866, 206-454-0479.

CIRCLE 439 ON READER SERVICE CARD

Voice Mail System Designed for Novell Networks

NEW Interactive has announced a voice mail system using Novell networks. The system, which consists of an 8-bit board, microphone, and software, allows voice messages to be sent between nodes.

Three configurations offer different microphone and speaker combinations, ranging in price from \$395 to \$495. CD or cassette tape

CONTINUES ON PAGE 64

FREE
Sidkick 2.0
See Your Dealer for Details.
(Offer good through October 31, 1991 with purchase of
specially marked packages of Paradox 3.5 (Not valid with
purchase of Upgrade versions, Multi-Packs or LANPacks.)

Borland's Paradox. Grasp the power of the new standard

Paradox® is now the recognized standard against which all other databases are measured. A database that is as

powerful as it is easy to use. That's why Paradox has won virtually every database award since its introduction. Including Best Programmable Database for both single-user and multiuser environments (*InfoWorld*, November 1990), the #1 SQL Front End (*NSTL*, February

1991) and Editors' Choice (*PC Magazine*, May 1991). Now you can grasp all of the power that Paradox offers.

Power Without Pain

Paradox's legendary combination of power and ease-of-use has made it the standard for applications developers and users alike. Paradox comes with a full-blown development language, PAL™, for building custom database applications. Plus features such as Query By Example,

multi-table forms and reports, and presentation-quality graphics that make Paradox the #1 choice of database users.

Extend Your Reach!

Paradox Engine and Paradox SQL Link

Paradox® Engine provides C, C++ and Pascal programmers with an Application Programming Interface (API), so your programs can access Paradox data in both single-user and multiuser environments. And with Paradox® SQL Link users can access remote data stored in SQL servers.*

dBASE† Owners!

Grasp Paradox RISK FREE for only \$175

If you own any version of dBASE®, you can upgrade to Paradox 3.5 for only \$175. That's a substantial savings off of the \$795 list price. And you get a 60-day, money-back guarantee. Risk Free. Paradox even reads and writes dBASE files for integration into your existing environment. Order today. See your dealer or call now at 1-800-331-0877.

B O R L A N D

Software Craftsmanship

CIRCLE 285 ON READER SERVICE CARD

CODE: MK95

*Microsoft, SYBASE, IBM, Oracle and DEC Rdb/VMS servers supported now. Paradox SQL Link (\$495 list price, sold separately) and Paradox 3.5 are required to make the connection with SQL servers. Paradox Engine is sold separately. †Offer also valid for owners of RBASE, dBaseIII and FoxPro. Upgrade offer expires 10/31/91. Pricing is in U.S. dollars. Offer good in U.S. and Canada only. Copyright © 1991 Borland. BI 14125N

New & Improved

BRIEFS

CONTINUED FROM PAGE 62



PRINTER ENHANCEMENT

Soletek Corp. has released Line Extender (\$128.95), a long-distance parallel line extender. The four-wire RJ-11-based cabling system can extend printing up to 1,200 feet. Line Extender supports 36-pin Centronics and 25-pin D-type male connectors. Soletek has also released the Compact Buffer (\$299.95), a software-independent pass-through print-buffer module that attaches to a 36-pin Centronics port. The 1.5- by 5.5- by 5.5-inch box comes standard with 256K and is user-upgradable to 4MB. 619-450-1220.

Eastman Kodak Co. and Computer Support Corp. have announced a Windows driver for Kodak's XL 7700 continuous-tone printer. The \$1,200 driver allows Windows users to access the True Color capabilities of the thermal-dye transfer printer and comes bundled with *Arts & Letters Graphics Editor for Windows*. 214-661-8960.

Brightwork Development is shipping Version 3.40 of *PS-Print* (\$395). The NetWare-based print server has been optimized to take advantage of Hewlett-Packard's LaserJet III series and can transfer 18,000 characters per second. 800-552-9876, 201-530-0440.

Fifth Generation Systems has announced Version 2.0 of *The Logical Connection Plus* (\$595). The new version offers several new utilities including Switch, which enables command line switching to any printer, plotter, or peripheral, and FGSmode, which sets a PC's serial ports to speeds up to 115 kilobits per second. The RAM footprint of the TSR has been reduced to 19K. 800-873-4384, 504-291-7221.



MULTIMEDIA

Paul Mace Software has added synchronized sound effects to *GRasp*, its animation development system. The \$99.95 utility supports Creative Labs' Sound Blaster card for recording and can output audio through that board, AdLib's AdLib card, or with a RealSound enhancement through the PC speaker. 800-523-0258, 503-488-2322.

players can be attached to a high-gain input for direct line level recording.

In addition to the board's 4-watt amplifier, the system includes drivers for Creative Labs Sound Blaster and Covox's Sound Master boards.

The system has a Microsoft Windows-based interface.

List Price: Sound System I (headset microphone), \$395; Sound System II (hand-held microphone and 8 ohm speakers), \$475; Sound System (gooseneck microphone and 8 ohm speakers), \$495. **Requires:** Novell NetWare, Version 3.11 or later. Interactive Inc., 204 N. Main, Humboldt, SD 57035; 800-292-2112, 605-363-5117.

CIRCLE 439 ON READER SERVICE CARD

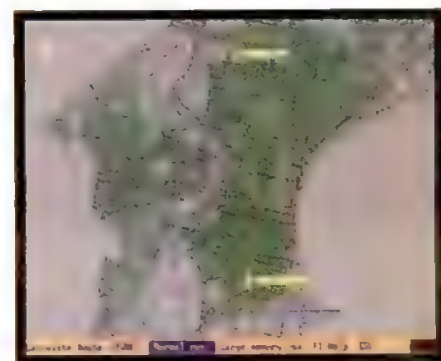
Road-Mapping Package Adds Custom Detail Features

IMPROVED Klynas Engineering has added a batch language to its *Streets on a Disk* series, allowing developers to display street maps from within other applications and launch applications within the program.

In addition, a run feature launches external programs from within a map display. The new maps can be displayed in 256-color .PCX format.

The system, which reads either .DBF files or comma-delimited ASCII tables to create map overlays, now allows maps with a half-million data points, 32,000 locations, and a feature that sorts plotted stops to plan trips more efficiently.

Klynas offers maps of the United States in modules ranging in price from \$50 to \$225. Modules are available in scales as low as 26 feet per inch.



Streets on a Disk integrates 256-color .PCX files into maps for user-defined route detailing.

List Price: *Streets on a Disk*, Version 4.1, \$225; ST-Batch macro language, \$75. **Requires:** 500K RAM, DOS 2.0 or Later. Klynas Engineering, 5301 Commerce Ave., Ste. G, Moorepark, CA 93021; 805-529-1717.

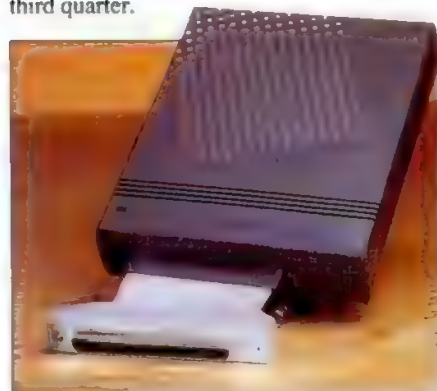
CIRCLE 440 ON READER SERVICE CARD

16/4 Token-Ring Adapter Plugs Into Toshiba Portables

NEW Megahertz's 16/4Mbps portable LAN adapter avoids the parallel bottleneck that hampers Xircom's parallel port adapter (see First Looks, page 46) by going directly to a Toshiba notebook's 100-pin external expansion slot. This provides true 16-megabit throughput on 16-Mb Token-Ring LANs.

The cards, available in both internal and external configurations, provide connectors for Type 1, Type 3, and Type 6 Token-Ring cabling. The cards support IBM's PC LAN, OS/2 Extended Edition LAN Server, LAN Manager, and Novell NetWare, and conform to IEEE 802.5 and 802.2 media and token access specifications.

The company plans to introduce a version for Compaq's 98-pin expansion slot in the third quarter.



Megahertz's external Token-Ring adapter connects to a Toshiba notebook's expansion slot.

List Price: T2TR internal Token-Ring adapter, \$799; T2TR/EA external adapter, \$999. **Requires:** Toshiba laptop or notebook with expansion slot. Megahertz Corp., 4505 S. Wasatch Blvd., Salt Lake City, UT 84124; 800-527-8677, 801-272-6000.

CIRCLE 441 ON READER SERVICE CARD

Utility Speeds PCL Jobs On PostScript Printers

NEW Breaking the bottleneck caused by printing non-Adobe PostScript applications on a PostScript printer, LaserTools Corp. has released its auto-switching utility, *Printer Control Panel*. The 5K TSR changes emulations between PostScript and PCL or PostScript and ASCII text transparently, depending upon the printer and print power needed.

The utility is also capable of creating four virtual LPT ports, each with its own preconfigured emulation (Diablo 630 and HPGL currently supported). LaserTools' utility was

CONTINUES ON PAGE 66

Borland ranked best Quattro Pro beats Lotus 1-2-3

Two recent industry studies objectively confirm the facts: Customers rank Borland best among software companies, and Quattro® Pro outperforms *all* Lotus® spreadsheets.

Borland: The technology leader.

Buying software shouldn't be an act of blind faith. Before purchasing your next spreadsheet, take a hard look at the company behind it. Bigger is not better!

Because Borland is smaller than our competitor, we work smarter, we try harder, and it's paying off: Borland was just ranked "Best Application Software in Customer Satisfaction, in Small and Medium Sized Businesses," in the prestigious J.D. Power and Associates survey.

Who would you rather buy your next spreadsheet from?

J.D. POWER AND ASSOCIATES

APPLICATION SOFTWARE
CUSTOMER SATISFACTION INDEXSM

June 6, 1991

1. **BORLAND**
2. WORD PERFECT
3. CLARIS
4. ALDUS
5. MICROSOFT
6. LOTUS

Quattro Pro: The standard of excellence.

InfoWorld reviews confirm what more than one million PC users already know: Quattro Pro is the best DOS spreadsheet that money can buy. Better than *any* Lotus spreadsheet including their recently released version 2.3.



B O R L A N D

Software Craftsmanship

Just check out the *InfoWorld* review results below. Quattro Pro wins in comparison to Lotus 1-2-3® hands down in *InfoWorld* and with more than 1,000,000 enthusiastic users.

	Quattro Pro	Lotus 1-2-3	
Number of ...	3.0 ¹	v. 2.3 ²	v. 3.1 ³
"Excellent"	7	2	3
"Very Good"	8	4	5
"Good"	0	5	4
"Satisfactory"	2	5	3
"Poor"	0	1	1
Overall score	8.4	6.3	6.5

¹ Source: *InfoWorld*, April 29, 1991. ² Source: *InfoWorld*, June 10, 1991.
³ Source: *InfoWorld*, January 28, 1991.

We don't blame Lotus for trying to underplay ratings such as these, but clearly Quattro Pro is more powerful. It has better graphics, better capacity, better macros, better consolidation and linking, and much more!

Borland and Quattro Pro: The obvious choice.

Company for company, product for product, the choice is clear. Join more than a million users and upgrade to Borland's Quattro Pro today! If you own any version of Lotus 1-2-3, for only \$129⁹⁵ we'll rush you your own copy of the best spreadsheet from the best company.

See your dealer or call 1-800-331-0877 now!

REPORT CARD		
INFO WORLD		
SPREADSHEET SOFTWARE		
Quattro Pro		
VERSION 3.0		
Criteria	(Weighting)	Score
Performance		
Formulas/analysis	(100)	Very Good
Compatibility	(50)	Very Good
Speed	(75)	Very Good
Database	(75)	Excellent
Graphics	(75)	Excellent
Output	(50)	Excellent
Macros	(50)	Very Good
Consolidation/linking	(50)	Excellent
Capacity	(50)	Very Good
Network	(50)	Satisfactory
Documentation		
Ease of learning	(50)	Excellent
Ease of use	(75)	Very Good
Error handling	(50)	Very Good
Support		
Support policies	(25)	Very Good
Technical support	(25)	Satisfactory
Value	(100)	Excellent
Final score		8.4

CODE: MJ37

1991 J.D. Power and Associates Computer End User Satisfaction Study Phase I. Office Based Small to Medium Sized BusinessesSM Response from Business End Users at 1,784 business sites. Small to medium sized businesses were based on office sites with between 1 and 499 employees. J.D. Power and Associates is a service mark of J.D. Power and Associates. Borland is a registered trademark of Borland International, Inc. Copyright © 1991 Borland International, Inc. All rights reserved. Quattro is a registered trademark of Borland International, Inc. Pricing is in U.S. dollars. Offer good in U.S. and Canada only. Dealer prices may vary. B-1429A

New & Improved

BRIEFS

Arkay Technologies is offering *PC-Sound*, a DLL-based sound enhancement product for IBM's *Windows* presentation package *Hollywood*. The \$98 extension ships with PC-SoundPort, an audio adapter that plugs into the printer port, a mini-speaker, and four disks of PC-Soundclips. Recording is accomplished with Arkay's PC-Recorder, a parallel-based microphone. Arkay is also shipping audio extensions for *Harvard Graphics* and *Lotus Freelance*. 603-425-2149.



CONNECTIVITY Coordination Technology

has released *Together* (\$4,995 per server; \$1,995 for a five-user pack), a groupware development system. The system allows networked users to encapsulate DOS and OS/2 applications, turning them into shared applications. Each user can define a workgroup at the beginning of an activity. *Together* supports IBM's *LAN Server* or Microsoft's *LAN Manager*. 203-268-4045.

Kalpana is offering the EPS-1500, an Ethernet switch with reported network throughput of up to 70 megabits per second. The higher speed, 6 times better than existing models, according to Kalpana, is achieved by using a cross-point switch matrix, similar to a telephone system's PBX, which eliminates switching delays.

The switch comes in 8-port (\$12,995) or 15-port (\$19,995) configurations and conforms to IEEE 802.3 standards. The EPS-1500 supports XNS, TCP/IP, LAT, and DECnet protocols. 408-428-1150.

Alien Computing claims to have released the industry's first Class 1 fax driver. The \$149 driver works with Alien's *FAXit for Windows*. 805-947-1310.

Microcom has announced the availability of *Relay Gold for Windows*. The \$399 asynchronous communication package takes advantage of *Windows* to offer font scaling, hot spots, cut/copy/paste functions through *Windows* Clipboard, and automation through DDE, HLLAPI, and *Relay's* scripting language. 203-798-3830.

CONTINUED FROM PAGE 64

previously released as an OEM add-in to QMS printers and in Adobe and Pacific Data printer cartridges.

List Price: *Printer Control Panel*, \$149.

Requires: Adobe PostScript or compatible printer, 5K RAM, DOS 2.1 or later. LaserTools Corp., 1250 45th St., Ste. 100, Emeryville, CA 94608; 800-767-8004, 415-420-8777.

CIRCLE 442 ON READER SERVICE CARD

ProCalc 3D Builds WorkCubes from Spreadsheet Files

NEW **Parsons Technology's** *ProCalc* can now stack spreadsheets to form what the company calls a "workcube." The program automatically updates stacked spreadsheets and allows users to rotate standard 2-D views based upon a single line item.

ProCalc 3D imports .WK1, .DBF, .DIF, and ASCII file formats. It features over 100 @functions, and has live links to Parsons' *MoneyCounts* package.

List Price: *ProCalc 3D*, \$89. **Requires:** 512K RAM, DOS 2.11 or later. Parsons Technology, 375 Collins Rd. NE, P.O. Box 3120, Cedar Rapids, IA 52406-3120; 319-395-9626.

CIRCLE 443 ON READER SERVICE CARD

LAN Calendar Shares Windows/DOS Files

IMPROVED **Campbell Services' OnTime** is now available in single-user or LAN packs and *Windows* or DOS versions. The scheduling software supports file locking and shares files regardless of the interface being used.

The calendar has several time grids, including day, week, and month. The LAN version allows time locking on individual schedules and will lock out time schedules for group meetings if conflicts exist. Security levels are set at individual stations.

List Price: *OnTime for Windows*, \$129.95; *OnTime* network version, 3-pack, \$297; 100-pack, \$3,900; (other prices/configurations available). **Requires:** *Windows* version: *Windows* 3.0; network version: DOS 2.0 or later. Campbell Services Inc., 21700 NW Hwy., # 1070, Southfield, MI 48075; 313-559-5955.

CIRCLE 444 ON READER SERVICE CARD

OCR Reads Both Printed and Handwritten Text

IMPROVED **Datacap's Paper Keyboard Pro**, a *Windows*-based OCR (optical character reading) package, can now read some hand-

printed information. The 16-page-per-minute OCR software is the first to integrate handwriting recognition with OCR, according to DataPro.

Paper Keyboard Pro supports Fujitsu, Bell & Howell, Ricoh TDC, HP, Microtek, and Pentax scanners, can read PostScript fonts, and integrates with other *Windows* products supporting DDE. The handwriting recognition program is trainable.

List Price: *Paper Keyboard Pro*, \$1,495; upgrade from *Paper Keyboard Win*, \$595.

Requires: Supported scanner, *Windows* 3.0. Datacap Inc., 5 W. Main, Elmsford, NY 10523-2416; 914-347-7133.

CIRCLE 445 ON READER SERVICE CARD

Gateway Introduces Multiuser OS

NEW **Gateway** has introduced *Great OS*, a DOS-based multiuser operating system for peer-to-peer or client/server LANs.

The system allows RAM, disk drives, printers, and other resources to be shared between each station. *Great OS* supports the OSI seven-layer model, uses MS-NET standards for multi-user program hooks, and supports Ethernet, X.25, and IPX communications standards.

Security, controlled by Gateway's LAN monitor and Station Manager utilities, allows network managers access to all data activity in real time.

For more information on multiuser operating systems, see *DR Multiuser DOS* and *Citrix Multiuser*, reviewed in First Looks, page 48.

List Price: *Great OS*, 5-user pack, \$495; 15-pack, \$995. **Requires:** Gateway G-Ethernet or G-Ethertwist Lan adapter. Gateway Communications Inc., 2941 Alton Ave, Irvine, CA 92714; 800-367-6555, 714-553-1555.

CIRCLE 451 ON READER SERVICE CARD

Magnavox Unveils Low-Cost CD-ROM

NEW **Magnavox** has begun shipping the CDD461RS, a \$549 CD-ROM player. The serial-connected player, compatible with audio and High Sierra CD standards, has both a headphone and stereo-out port.

Magnavox claims that the CDD461RS has an average transfer rate of 153.5 kilobytes per second and rates the drives' average access time at 700 milliseconds.

The player ships with either an 8- or 16-bit interface card, cables, and Microsoft's CD-ROM drivers and DOS extensions. The CDD461RS is not currently compatible with Microsoft's multimedia extension standard. ■

List Price: Magnavox CDD461RS, \$549.

Requires: Open AT slot. Philips Consumer Electronics, Inc., 1 Philips Dr., Knoxville, TN 37914, 800-882-1888, 615-521-4499.

CIRCLE 452 ON READER SERVICE CARD

IMPRESSIVE.

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Presenting an impressive example of computing power, portability and affordability.

The Tempo™ LX 20MHz Notebook, from Everex™.

It packs all the power and speed of a 386™SX desktop computer. In your choice of 20MB, 40MB or 60MB internal hard drive configurations and room for up to 5MB of RAM. In addition to the specs listed below, the Tempo LX comes with a big, brilliant VGA display, a comfortable, intelligently laid out keyboard, one serial and one parallel port, one external analog monitor connector and an optional 80387SX math coprocessor for serious power users.

Yet while the Tempo LX may perform like a desktop, the similarity ends there. Because at a mere 7.1 pounds (battery included) and 2 x 10 x 12 inches, it's small enough to fit inside a standard briefcase. Its NiCad battery will run up to three hours on one charge, and can be recharged in just an hour. Moreover, when not in actual use, the system can enter into a power-saving stand-by mode to conserve battery life.

Best of all, this power and portability can be yours for a mere \$2,599*.

If anything should ever go wrong with your Tempo LX, simply call us and we'll have Federal Express pick up your system, free, anywhere in the

With every purchase of a Tempo LX Notebook, you'll receive at no additional cost these valuable items.

- | | |
|------------------------------|-------|
| • FREE Mouse | \$80 |
| • FREE DOS 5.0 | \$130 |
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TOTAL VALUE \$424 FREE!

continental U.S. We'll have it back to you within 48 hours from the time we receive it. Fully functional.

Even more assuring is that Dataquest* named Everex number one in customer satisfaction.

Pick up the Tempo LX at a reseller near you. To find out where, call 1-800-437-EVER. Outside the U.S. call 510-(formerly 415) 498-1111 or FAX us at 510-651-0728.



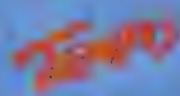
**NOW only
\$2599**



Tempo LX Notebook \$2599

- Intel® 80386SX 20MHz CPU
- Full Travel, 82-Key Keyboard
- 1MB RAM (Expandable to 5MB)
- 1.44MB 3.5" Internal Diskette Drive
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- 1-Hour Quick Charge
- Optional Internal 2400 Baud Modem

- One Serial/One Parallel Port/One External Analog Monitor Connector
- 7.1 Lbs. (Including Battery)



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Now it doesn't take an expanded wallet to expand your communications horizons. All it takes are high performance modems from Everex™.

Fact is, the Everex modem line is one of the most affordable in the business. And one of the broadest. From Evercom data modems to the Carrier portable and EverFax data/fax modems, there's an Everex solution that's right for almost any communications need.

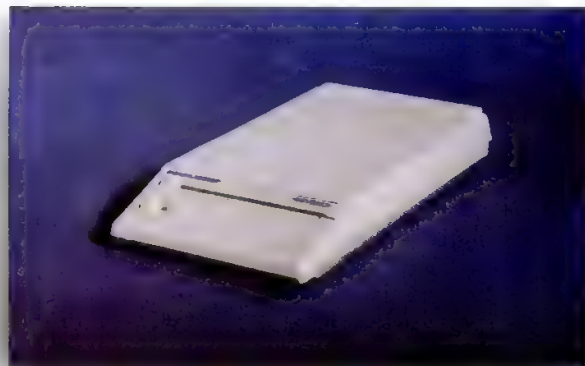
For maximum flexibility, Everex offers both internal and external modem models. And all are extremely easy to install and operate. CINSTALL installation utility software comes standard, and opens up a full range of standard features. Like ProComm® Communications Software, AT Compatible Command Set, Built-in Speaker and Diagnostics, LED Status Indicators, 4-Number Save and User Configuration Save.

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What's more, Everex modems come from one of the world's leading manufacturers of IBM®-compatible PCs and peripherals. So, whether you're at your desk or on the road, you can be assured of compatibility, reliability and solid support.

Everex modems are available at a reseller near you. To find out where, call 1-800-468-EVER. Outside the U.S., call 510 (Formerly 415) 498-1111 or FAX us at 510-651-0728.

And start communicating more expansively. Inexpensively.



Evercom 24

Starting at \$129

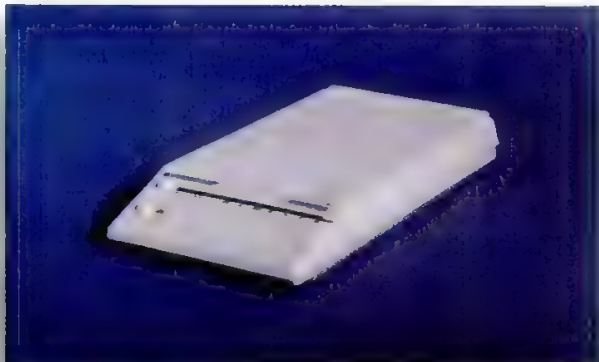
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- Internal & External Models
- Available with MNP Class 5 Data Compression & Class 2, 3, & 4 Error Correction
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All Everex modems and fax modems include the following standard features.

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- Built-In Diagnostics
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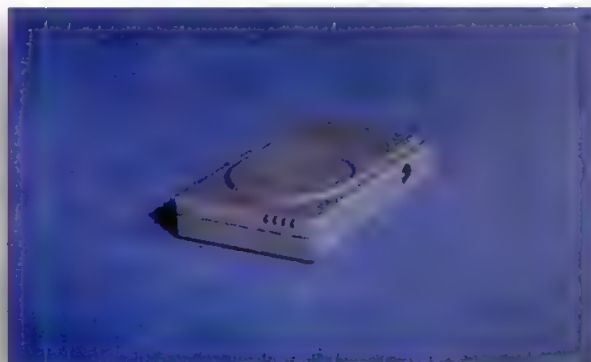
SIVE.



EverFax 24/96E

\$499

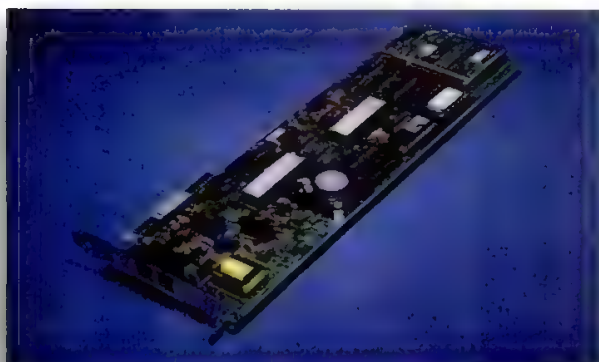
- 2400 Bps Data Modem with 9600 Bps Fax Modem
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- MNP Class 5 Data Compression
- MNP Class 2, 3, & 4 Error Correction
- Full-featured EFax software
- Automatic Data-to-Voice Switching
- Sound Cues



Carrier 24/96

\$399

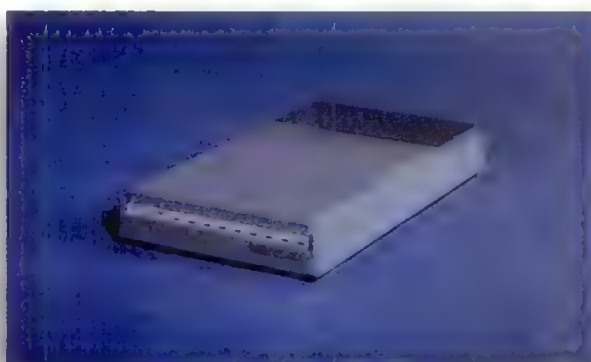
- 2400 Bps Portable Data Modem with 9600 Bps Fax Modem
- MNP Class 5 Data Compression
- MNP Class 2, 3, & 4 Error Correction
- Battery or AC Operation
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- Automatic Data-to-Voice Switching
- Sound Cues



EverFax 24/96

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Evercom 96

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- V.42bis & MNP Class 5 Data Compression
- V.42 & MNP Class 2, 3, & 4 Error Correction
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- Automode—automatic transmission rate adjustment
- High Performance Buffered UART (Supports Steady Transmission & Reception at High Speed)
- Automatic Data-to-Voice Switching

THE FINE ART OF DISC DRIVES



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When it comes to the SCSI interface, no one has a more complete palette of disc drives than Seagate.

With capacities starting at 30 megabytes and escalating to 2.1 gigabytes, Seagate has a SCSI storage solution for every application. Form factors range from 3.5" low-profile for PCs and Macintoshes all the way up to 8" drives for mainframes and supercomputers. And they feature a variety of access times and price points to meet your specific requirements.

For more information on the classic SCSI disc drives using the latest technology, contact your authorized Seagate distributor. Or call Seagate at 800-468-DISC, or 408-438-6550.



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edited by
Matthew J. Ross

Read Only

Reviews of the Latest Books for the PC User

A Look Inside the World of High-Tech Venture Capital for Entrepreneurs-to-Be

High-Tech Ventures, C. Gordon Bell's look into the world of high-tech start-ups, is not exactly the kind of book you want to curl up with next to a cozy fire on a drizzly fall weekend. Unless perhaps you have dreams of becoming the next Bill Gates.



This book is a fascinating mix of abstract concepts, insightful checklists, and inside stories on dozens of high-tech companies—some familiar names, and some not so familiar. The author, Gordon Bell, managed engineering projects for 23 years as vice president of research and development at Digital Equipment Corp. (DEC). Armed with involvement in more than 20 start-up companies since then, he is in a perfect position to discuss the topic.

Bell tries to quantify factors that might appear to be too qualitative to be measured with a number. In collaboration with Heidi Mason, he developed the Bell-Mason Diagnostics, a rule-based system for measuring the condition of start-up ventures. The basic concepts of the system provide the outline for the book: people, business plan, finances, technology and engineering, manufacturing, product, and marketing and sales.

Each chapter explains the importance of a topic, provides detailed warnings about the flaws that may be encountered, and ends with an annotated checklist of rules you can use to evaluate a company's condition. The final chapters include case histories that illustrate how the analysis predicts success or failure.

Throughout the book, Bell treats you to an inside look at the history of dozens of start-ups,

including Cirrus Logic, DEC, Dell Computer, GO Corp., Kurzweil, Intel, MIPS, Sun, and Zilog. These interesting analogies include stories of successes and failures, plus powerful quotes from key players in high-tech

industries. For example, you'll find that "in the early 1980s... DEC's disastrous foray into PCs cost the company nearly a billion dollars," as well as insight into where the company went wrong.

The book contains many charts and graphs that vividly illustrate some major points. The analysis of price/performance ratios of successful products over time is alone worth the price of the book. There are also handy tidbits, such as a look at the formula one venture capital firm uses to evaluate investment opportunities.

High-Tech Ventures gets a bit repetitive, but that's forgivable since it is done to drive home key points. Bell and coauthor John E. McNamara know their field well and back their statements with frequent citations of other books.

If you or someone you know is contemplating a start-up, or is

involved in one now, get this book. Or you may simply be one of the "students of the start-up process and other voyeurs" whom Bell also addresses in the preface, in which case you can look forward to a book that opens the door on the real-life game where millions are won and lost.

—Alfred Poor

High-Tech Ventures: The Guide for Entrepreneurial Success

by C. Gordon Bell with John E. McNamara, \$29.95, Addison-Wesley Publishing Co., Jacob Way Inc., Reading, MA 01867; 617-944-3700. ISBN: 0-201-56321-5.

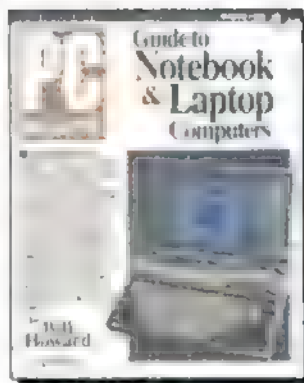
CIRCLE 429 ON READER SERVICE CARD

PC Magazine's Bill Howard Shows That You Can Take It with You

PC Magazine Guide to Notebook & Laptop Computers by Bill Howard, executive editor of *PC Magazine*, is a meaty orientation to laptop computing for the desk-bound PC user. Howard does an exemplary job of boiling down laptop computing topics into digestible servings.

The book from ZD Press (a division of Ziff Communications, the parent corporation of *PC Magazine*) is organized into two parts. Part 1, "Purchasing a Laptop," clearly defines portable computing terminology, evaluates laptop features, and explains "how to buy the right computer at the right price." Howard thoroughly details buying options: where to buy, what discounts to expect, and extended warranties.

Part 2, "Using a Laptop," makes up the bulk of the book, covering a wide range of portable computing and communications topics. Howard proves he is a master translator of com-



puter communications concepts, an area that he refers to as "a mine field of acronyms, definitions, protocols, and buzzwords." The communications chapters explain making modem connections during your travels

(including a dozen ways to hotwire a modem to a nonstandard telephone line), choosing among file-transfer options, connecting laptops to a network, and working with remote-control software. Noticeably missing, however, is coverage of general communications software.

While *PC Magazine Guide to Notebook & Laptop Computers* contains a wealth of information, the book suffers from poor cross-referencing. For example, chapter 4 discusses buying a laptop but doesn't reference the excellent buyer's checklist buried in Appendix G. Howard also doesn't reference any of the companion disk's utilities.

Ironically, Howard instructs

his readers to buy *PC Tools*, an inexpensive group of integrated utilities that perform most of the functions of the book's companion disk's programs. Most of the programs on the disk are more difficult to use than their *PC Tools* counterparts.

In spite of certain logistical shortcomings, Howard's clear, concise explanations, sound, opinionated advice, and bevy of hands-on tips make *PC Magazine Guide to Notebook & Laptop Computers* a valuable resource for the budding laptop road warrior.

—Brent Heslop and David Angell

PC Magazine Guide to Notebook & Laptop Computers

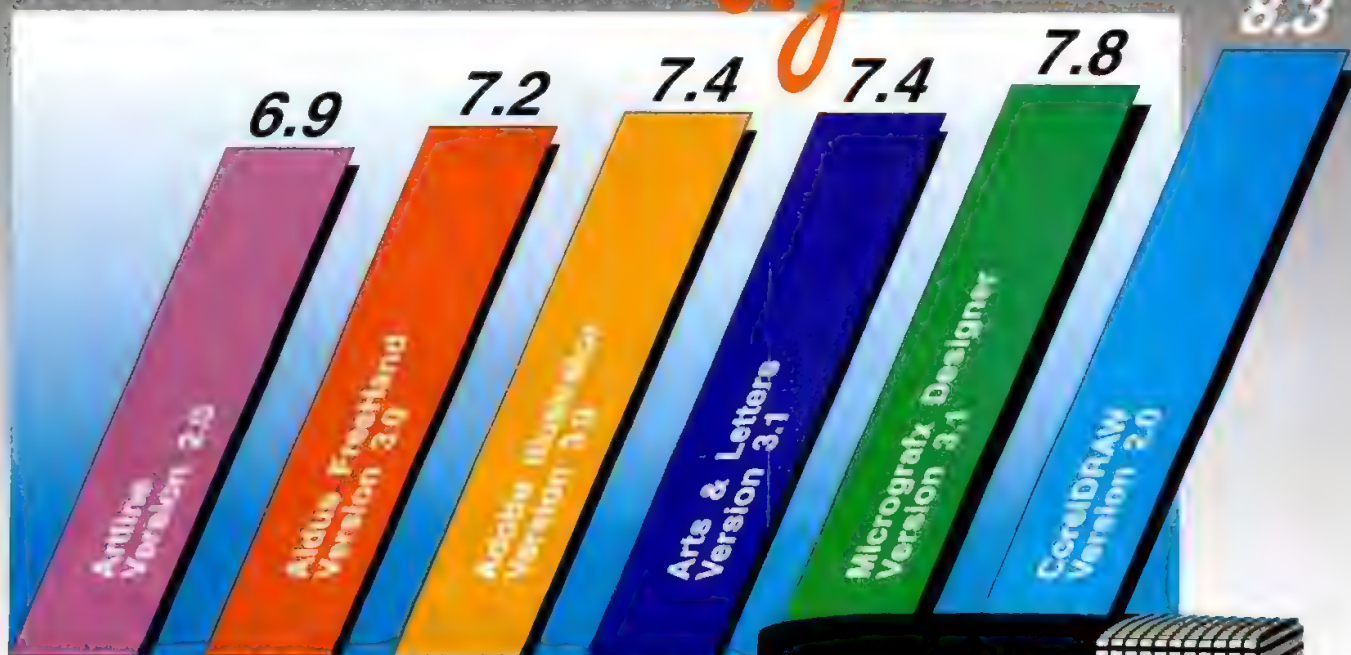
by Bill Howard, \$29.95 (includes disk), Ziff-Davis Press, 5903 Christie Ave., Emeryville, CA 94608; 800-688-0448, 415-601-2000. ISBN: 1-56276-005-X.

CIRCLE 542 ON READER SERVICE CARD

Brent Heslop and David Angell are partners in Bookware, a technical writing firm. They have written several computing books and write a book review column for *Computer Currents*.

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InfoWorld Product Comparison June 17, 1991

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*Mike Heck, Dong and Denise Torres
InfoWorld, June 17, 1991.

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A Comprehensive, High-Speed Tour Of PC Telecommunications

The Modem Reference, Second Edition, makes no bones about telecommunications' overwhelming role in the future of information transfer. The attraction, however, of this well-developed tutorial lies in its ability to relay the enjoyment and constructive usefulness of modem communications as they exist here in the present.

As complete a book as this is to users new to the vast wonders of the on-line world, author Michael A. Banks has underestimated the realm of his work by naming it simply *The Modem Reference*. While it does present



many of the technical aspects of modem works in a heartening nontechnical delivery, it encompasses much more than simply the machinery of data transmission. A more befitting title would refer to the entire tele-

computing universe into which the author clearly has entrenched himself.

Beginning with an instruction set on the basic requirements and setup configurations for start-up modem communications, the book evolves into an articulate companion for many phases of on-line computing. Communications software, electronic mail

services, and ASCII and binary file transfers are thoroughly examined and explained. The dialogue is straightforward and, although I hate to use the term, user-friendly. Banks is not trying to sucker anyone into what could easily become an expensive hobby.

The pros and cons of bulletin board services, commercial on-line services such as CompuServe, GENie, and Prodigy, and business networks such as Dow Jones and Dialog are given thorough walk-throughs. The chapters devoted to these consumer and business networks, as well as database and information retrieval services, offer pricing comparisons, feature charts, login procedures, and menu commands.

The single glaring infraction is the book's lack of exploration into a significant player in the on-line world, V.32/V.42bis 9,600-bit-per-second modems. They are mentioned here in passing only

as a point of reference. These high-speed units, with their data compression and error correction (in the case of the V.42bis modems), are rapidly becoming the standard for safe, low-cost PC telecommunications. The high purchase price of a V.42bis modem will quickly be returned in reduced transmission cost and added data security.

The Modem Reference remains most comprehensive, though, even when operating at high speeds. To ignore this guide and the information and education it offers for both beginning and advanced operations would be an opportunity lost.—Chris Parker

The Modem Reference

by Michael A. Banks, \$24.95, A Brady Book, Simon & Schuster Inc., 15 Columbus Circle, New York, NY 10023; 800-624-0023, 212-373-8093. ISBN: 0-13-589862-5.

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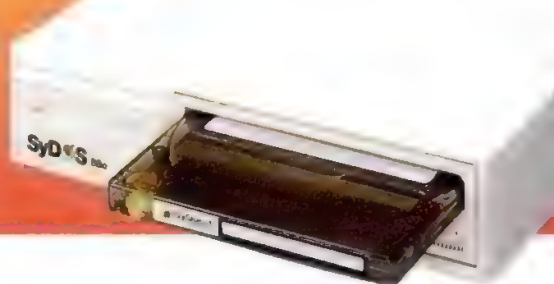
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edited by
Trudy Neuhaus

Toolkits

Reviews of the Latest Tools for the PC Programmer

TurboPower's TSRs Made Easy Lives Up To Its Name

Sooner or later, every aspiring young programmer gets the urge to write a TSR. And old-timers groan and prepare for a barrage of questions, most of which boil down to "Why doesn't this work?" The prime reason is that DOS is just plain hostile to TSRs; there are many obstacles to trip up the unwary. Fortunately for Turbo Pascal programmers, TurboPower Software has handled all the hard parts in *TSRs Made Easy*, a \$49 subset of the company's extensive *Object Professional* library. You can use it as a "black box" or study the source code and learn how TSRs work.

Using the units provided in *TSRs Made Easy*, you can make virtually any program into a TSR. But that's not all. These units also give you the support functions you'll need *after* you get your program loaded into memory. Programs created with *TSRs Made Easy* can detect themselves in memory to avoid loading twice, unload from memory on command, change hotkeys, and even respond to calls from external programs.

OPTSR FOR SIMPLE POP-UPS

To make a small program into a hotkey-activated TSR, include the OPTSR unit in your Uses clause. Then choose a hotkey, matching any combination of Alt, Ctrl, Left Shift and Right Shift with any main key. Next, decide whether your TSR needs to wait until DOS is ready before it pops up (if you're not sure, wait!). Finally, put the code that performs the desired action into a FAR procedure with a single VAR parameter of type Registers (defined in the DOS



unit). Only three calls to the OPTSR routines are absolutely necessary; it takes less than a screenful of code to interface your program with the *TSRs Made Easy* units.

Of course, if you add a little more code, you can do more. For example, you could add a secondary hotkey that tells your TSR to remove itself from memory. Or, you could pass requests from the command line to the copy of your TSR in memory. To do the latter, just use one OPTSR routine to locate the program in memory and another to call a procedure residing in the in-memory copy of the program. Now you can pass information from the command line to the TSR in memory.

SWAPPING TSR EASES RAM CRAM

For large TSR applications, you'll want to use the TSR-swapping technology of the OPSWAP and OPSWAP1 units. These units let you make an application of virtually any size into a TSR that takes up only 6K when inactive. Pressing its hotkey tells the resident portion of your TSR to swap the current contents of memory to disk or EMS and load the rest of itself from disk or EMS. Of course, you can't invoke such a TSR when a time-critical activity such as telecommunications is going on, but that's a minor price to pay.

TSRs Made Easy also features a macro capability that you can use to record and play back keystrokes, or to paste data from a TSR into the underlying application. It does more than merely stuff keys into the 15-keystroke keyboard buffer: You can paste

as much data as you please. The sample program, CUTPASTE.PAS, is a complete interprogram cut-and-paste utility demonstrating this feature.

When you write a program that needs to EXEC another program, you often run into memory problems. The child program can use only the RAM that the main program has *not* claimed, and if the main program is large, there may not be enough. However, the OPEXEC unit will allow your main program to use *all* available memory and swap itself out to disk or EMS before executing a child program. The result is that the child program has access to all but about 6K of available memory.

SAMPLE PROGRAMS

To show how powerful *TSRs Made Easy* is, TurboPower combines the swapping TSR and swapping EXEC concepts in POPDOS.PAS. When you pop up this sample program over an application, it first swaps the application to disk, then swaps itself to disk, leaving you at a DOS prompt with plenty of available memory. It's a "shell to DOS" option for applications that don't have such an option.

TSRs written with *TSRs Made Easy* aren't restricted to activation by hotkey. The ALARM.PAS sample program pops up with a message at a preset time, and IOLOG.PAS traps and logs all calls to two dozen DOS functions that involve I/O. Actually, the IOLOG sample program is a useful utility in its own right: If an application is having I/O problems, you can use it to find out exactly what's going wrong.

For a grand finale, the DESKPOP.EXE sample program is a multifunction TSR that rivals *SideKick 2.0* in features. It has a file manager, file browser, text editor, calculator, calendar, phone-

book/dialer, and programmer's quick-reference chart. DESKPOP is supplied as an .EXE file because you cannot compile it without the window and user interface routines from *Object Professional*.

The sample programs are very helpful in understanding *TSRs Made Easy*, but they're not your only resource. Nearly half the manual is devoted to a cross-referenced list of every routine in the *TSRs Made Easy* units. And of course, you have the complete source code at your disposal if you want to investigate further.

Even with a full and well-tested library of working routines, you may still need technical support. Perhaps you're attempting to write an unusual kind of TSR—one that doesn't seem to be explained by the examples. TurboPower maintains an active technical support presence on CompuServe (section 6 of the PCVENB Forum). Your questions are answered by the programmers who write the code. Telephone support is excellent as well, though not toll-free.

In its incarnation as part of *Object Professional*, *TSRs Made Easy* has been tested in real-world programs for a number of years, and you pay no royalties for using it. TurboPower's president, Kim Kokkonen, personally guarantees that it will make writing TSRs in Turbo Pascal easy, or you get your money back (within 30 days). I'm sure he won't have to pay off on that guarantee very often.—Neil J. Rubenking ■

TSRs Made Easy

List Price: \$49. Requires: 512K RAM; Turbo Pascal, Version 5.0 or later; DOS 2.0 or later. TurboPower Software, P.O. Box 49009, 1065 Elton Dr., Colorado Springs, CO 80907; 719-260-6641, 800-333-4160 (orders only).

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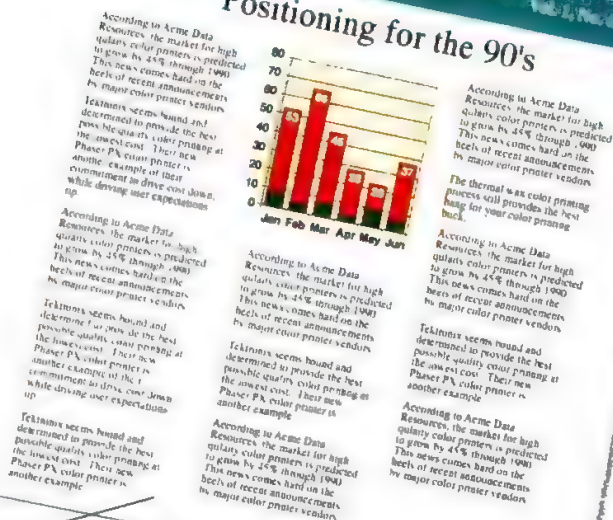
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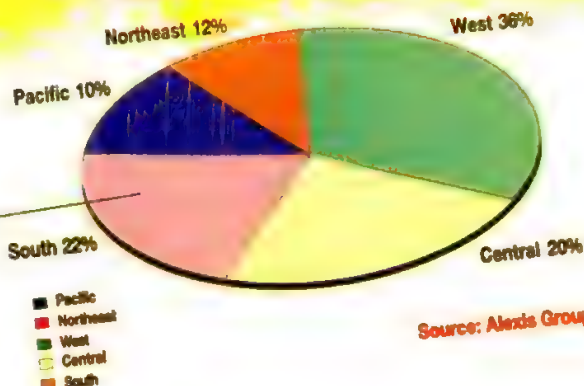


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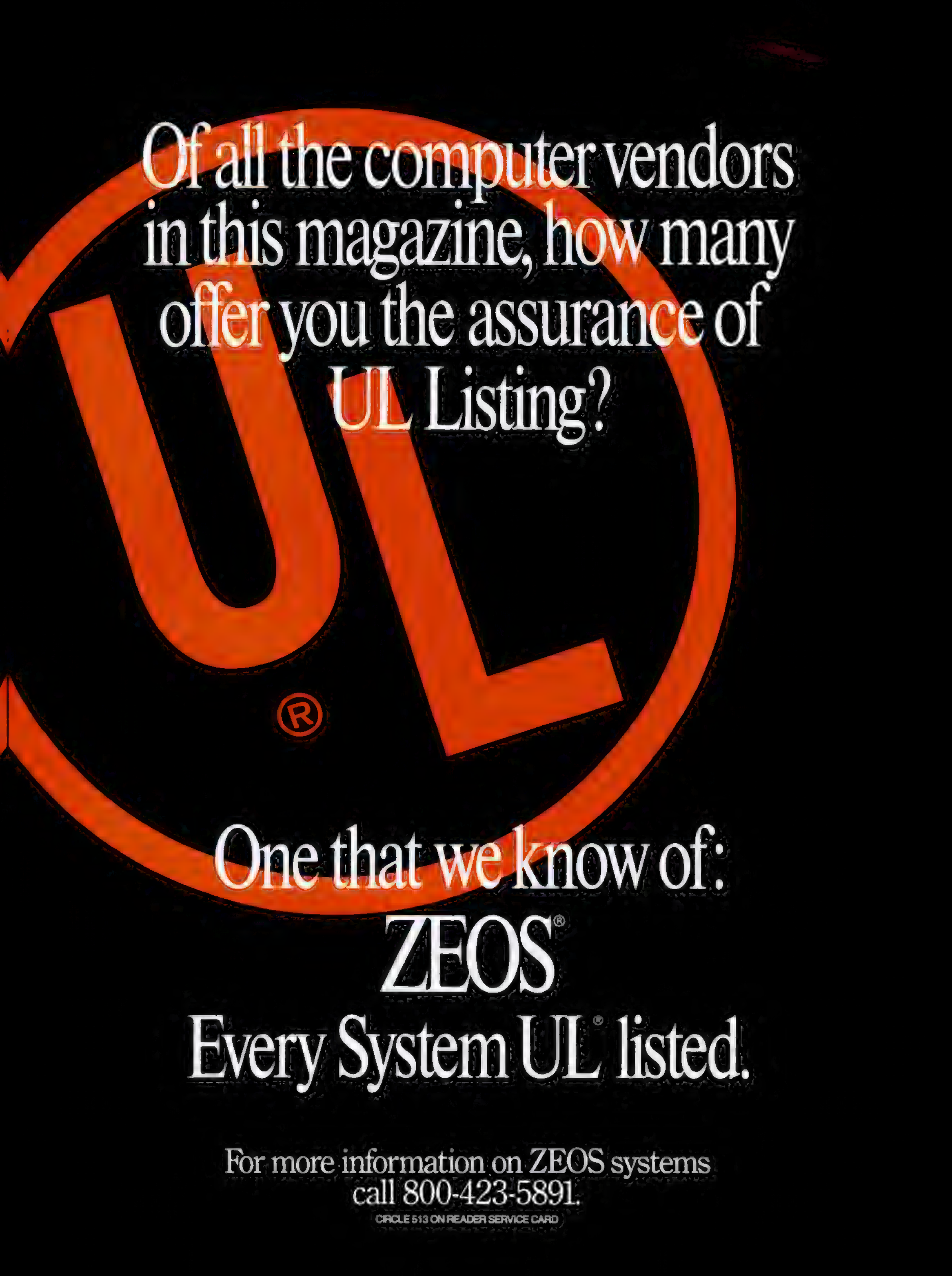
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Michael J. Miller



The Iconization Of Software

Lotus' new 1-2-3 for Windows clearly demonstrates that today's icons can coexist with all of yesterday's interfaces.

Lotus Development Corp.'s new *1-2-3 for Windows* (which was not yet available as of this writing) is an interesting example of how a program can span several generations of user interface design.

As you would expect from any *Windows* program, *1-2-3 for Windows* has full mouse support and pull-down menus following modern user interface conventions. It has the standard File, Edit, and Help menus. Common commands such as open and print are gathered together under the File menu. These are the things you would expect from any *Windows* program, and basically, for all modern programs.

The big selling point of the program, though, is that when you hit the Slash key, the original "1-2-3 Classic" menus pop up on top of the *Windows* menus. If you hit the Colon key, you get the menus from the WYSIWYG add-in that

brought on-screen font and graphics support to *1-2-3*, Releases 2.3 and 3.1. This means that the program offers complete keystroke compatibility with the current character-based versions of *1-2-3*, something that the millions of people who currently run *1-2-3* will undoubtedly find appealing.

The *1-2-3 Classic* menus are a great idea. With them, Lotus offers keystroke compatibility but still lets the spreadsheet work like any modern *Windows* application. It's a much better solution than doing pull-down versions of the original menus, because most serious users of the program will be ultimately better off forsaking the old and learning the new *Windows* menus. This will make it easier for them to work with other *Windows* programs, and experienced *1-2-3* users can always fall back on the old commands that they know so well. And this structure ensures complete macro backward-compatibility—something that's currently lacking in all of the *Windows* spreadsheets.

For those eager to learn the new GUI way,

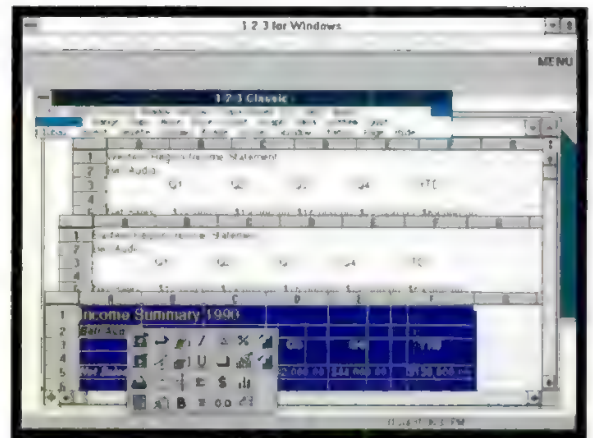
I'd like to see Lotus offer an optional help system that shows the new way of working after you've entered old-style commands. This could be similar to *Microsoft Excel 3.0*'s help system, which does a good job of demonstrating and executing the *Excel* equivalents of most *1-2-3* keystrokes.

MENUS: PAST, PRESENT, AND FUTURE

1-2-3 Classic's horizontal menu bars represent the past. The standard pull-down menus represent the present. But it's the program's use of icons to perform common tasks that represents the future.

Icons have long been a part of graphical programs. They are an integral part of how people expect to use a painting, drawing, or technical illustration program. In part, that's because these programs require a mouse.

And that mouse is now a standard part of the computing environment for traditional business applications, at least for those people running *Windows* or Presentation Manager. It doesn't take long to figure out how much easier it is to click on a single icon than select a series of commands from a menu. As a result, icons are appearing in traditional business



Not just good looking, the icons in *1-2-3 for Windows* make the spreadsheet easier to use.

applications: word processors, databases, and spreadsheets.

At their core, icons are shortcuts. In their least-impressive incarnation, they are simply another way of pulling down a menu and selecting a single command. At their most

Michael J. Miller

impressive, icons let you perform a task that would otherwise take multiple steps.

For instance, most formatting commands typically require going several layers deep in a menu structure, but could be represented as a single icon. The auto-sum feature pioneered in *Excel* lets you

click on an icon to sum up an adjacent row or column automatically. It's one of the biggest time-savers I've seen.

1-2-3 for Windows loads with an icon palette that lets you perform the most common functions with just a single click: opening, saving, and printing files, cutting and pasting cells, and formatting or charting a range of cells.

Icons aren't a new concept. Spreadsheets that use them date back to some of

the lesser-known Macintosh spreadsheets of several years ago. (Does anyone remember a program called *Crunch?*) Informix's *Wingz* (available for the Mac, *Windows*, and for OS/2) really showed off the advantages of having a customizable icon bar, where you could even attach macros to their own icons. But it was *Microsoft Excel 3.0* that sent the popularity of spreadsheet icons soaring. Like *Word for Windows*, *Excel 3.0* has a toolbar containing a fixed set of icons that make short shrift of the basic spreadsheet formatting commands.

1-2-3 for Windows extends the icon concept a step further. Its icon palette "floats" so you can place it wherever you'd like on-screen. And it is customizable. You can choose from a basic set of about 50 icons, so that the functions (or macros) you use most appear in the palette. Most people will probably stick with the default set, but even so, the icon palette makes the spreadsheet easier to use.

GOOD OLD 1-2-3 FUNCTIONALITY

From a functional standpoint, *1-2-3 for Windows* is virtually identical to *1-2-3 Release 3.1+*, including 3-D spreadsheets, graphs that you can insert into your worksheet, and a solver module. It will come with *Adobe Type Manager*, offering you scalable fonts, but is limited to displaying only eight active fonts and sizes.

One nice feature is being able to enter a draft mode, where you turn off all formatting. This makes entering numbers much faster, and lets you move cells simply in the fashion of the original *1-2-3*.

1-2-3 for Windows just doesn't feel quite as polished as *Excel 3.0*. In particular, *Excel* currently does a better job integrating graphs and spreadsheets, and several little details of the interface feel smoother.

Over the next couple of years, I expect it will be quite interesting to watch *Excel*, *1-2-3 for Windows*, and others experiment with different ways of extending icon use and other user interface innovations. In particular, I'm waiting to try out Borland's promised object-oriented features in the upcoming *Quattro Pro for Windows*.

But for now, *1-2-3 for Windows* stands out because of the three different ways it gives you to run the spreadsheets: *1-2-3* Classic menus, standard *Windows* menus, and the latest step in the "iconization" of software. By combining these methods, it offers an interesting blend of the old and the new. ■



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Bill Machrone



Feeling Old? How About Obsolete?

Now that the PC is ten years old, it's time to look forward to some of the trends that will shape the next decade.

If you can build it, it's obsolete. That's been the watchword of the electronics industry for as long as anyone can remember. There's always a better technology, always a new idea. And nowhere has this been more true than in the personal computer industry. The PC democratized digital electronics. It put computing power into everyone's hands and revolutionized the way business is done. The revolution continues still, but it's now so pervasive that it's no longer perceived as a revolution.

I'm crazy to even try to predict the next ten years, and I usually have a strong aversion to crystal-ball gazers. I prefer to practice the art of the possible. But I'm angered by the amount of Panglossian complacency I see today, in which this is declared to be the best of all possible worlds, give or take a few megahertz. So let's spend a couple of minutes

looking at the things that absolutely, positively will happen—and a few that should.

Remember the movie *Peggy Sue Got Married*? Kathleen Turner tells the high school nerd about the future: "Everything gets smaller—except radios!" It's certainly true of computers, and the shrinking will continue. Ultimately, the size limit will be determined by the user interface, not the laws of physics. Poqet has proven that you can make a keyboard that's too small. Keyboard-driven portables won't get any smaller than 8 by 10 inches, although they'll get thinner, lighter, and far more powerful. They'll utterly replace today's desktop machines for all but a few specialized applications.

Buying Hewlett-Packard's \$695 palmtop with *Lotus 1-2-3* built-in today is a lot like buying the original HP-35 back in 1970. You'll get oohs and ahhs from your peers, until they buy something that's half the size and a quarter of the price a couple of years later. Palmtops will ultimately be seen to have the wrong user interface. Pressing tiny buttons to make big things happen is a joke. The pen is the right interface for palmtops. Gestures and character recognition can be scaled, so your

big scrawls can become tiny characters. The user interface can be completely soft; the palmtop can finally be as handy as your pocket calendar and as powerful as your desktop PC.

Today's clipboard-sized, pen-based machines are a noble experiment, but they're subject to the same rapidity of change that awaits the palmtop segment. Ultimately, the only difference between pen-based machines and palmtops will be size. How much display/writing area do you want?

THE INTERFACE RACE

Keyboards won't go away. Pens are here to stay. Voice will be nice, but what's to become of mice?

PROCESSORS AND POLITICS

Your microprocessor used to reveal your politics. An Intel bias said one thing, a Motorola bias said another; a SPARC bias wasn't a bias at all but a religion. Now we're getting to the point where it doesn't matter anymore. Microsoft's OS/2 3.0 will run on several politically correct processors, those that have paid proper fealty to Redmond, Washington. Apple and IBM are working toward a common operating

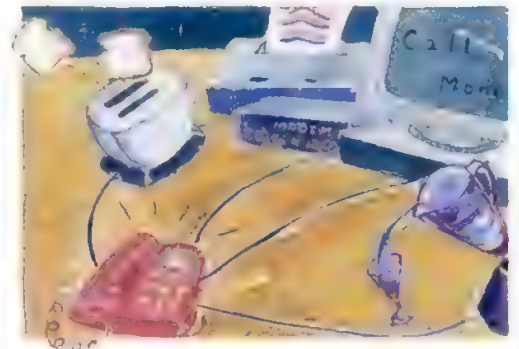


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system. Novell owns DR DOS. Banyan does Mac. And the Unix "community" will still be trying to get its act together. Unix devotees will need the conviction of religious zealots to keep their faith alive. RISC in general, and the ACE initiative in particular, will turn out not to have mattered as RISC techniques are used to build CISC processors.

Almost everyone has more mips than necessary today and will have even more tomorrow. The horsepower race will end, and the

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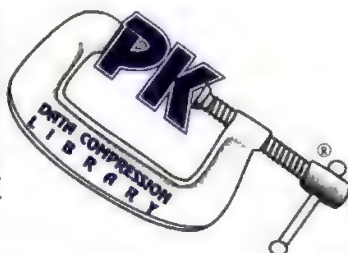
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Bill Machrone

economy race will begin. Intel will grudgingly share the market with several 386 instruction set-compatible processors, and all will build low-power chips. File servers will gain greater strength from multiple processors, not 200-MHz clock speeds. On-chip multiprocessing will become the norm for high-end machines. The bus wars will have ended inconclusively, as more functions get moved to the motherboard.

RANCH VS. HIGH-RISE STORAGE

The end of moving parts is in sight. An American company will introduce a 256-megabit chip, neatly one-upping the Japanese 16- and 64Mb chips. When you have more main memory than most people today have disk storage, you begin to look at things in a new way. Associative techniques will become a necessity for finding things in memory. Memory coprocessors that manage cache and main memory will become common. But even these monster chips won't kill hard disks, which keep getting faster and smaller. It'll take some new form of solid-state data storage to do in the disk drive—most likely crystal lattice memory, where data is stored as electrical charges at the molecular level, in three-dimensional coordinates.

IMPLICIT CONNECTIVITY

Your palmtop, desktop, telephone, LAN, TV set, answering machine, etc., etc. will all talk to one another. Video messaging and teleconferencing via your PC will become common. Infrared and spread-spectrum radio technologies will compete for local connectivity, with radio probably winning due to its lack of directionality. I just hope it doesn't turn out to be yet another form of environmental pollution.

Peer-to-peer networking will be the norm: Plug any two machines together and they'll recognize each other, share data, and communicate. Larger operating systems will carry on the pioneering work done by Banyan in distributing directories, so that pieces of what the system knows can be in far-flung locations.

All these predictions—and we haven't even touched on video, applications software, operating systems, new input and output devices, real-world interfaces, or half a dozen other worthy topics. Time enough for all of them in the future. ■

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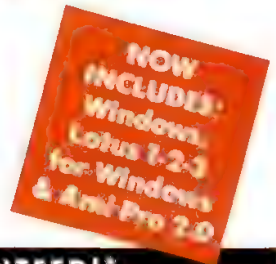
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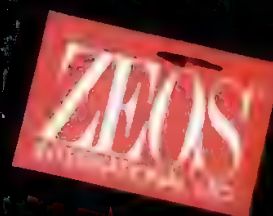
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John C. Dvorak



Is the Microsoft-IBM Feud A Hoax?!

Bill Gates' IBM-bashing memo and the rift between Microsoft and IBM have received widespread news coverage, but is this really just corporate intrigue or a gigantic hoax?

It began with the now infamous Bill Gates memo—the one first leaked by the *San Jose Mercury News*. The memo criticizes IBM for providing Microsoft with lousy code and intimates that Microsoft is better off without IBM.

Most observers feel that this memo is the culmination of a rift between the two companies that began around the time bug-ridden DOS 4.0 was released, and was heightened by the success of *Windows 3.0*.

On the other hand, this might be part of a complex scheme—it may be a hoax. The entire feud could be part of an incredible plot. Let's look at four possible scenarios.

1) The joint-venture hoax theory. IBM and Microsoft create the illusion of a hoax. With the two companies seemingly apart, they can infiltrate the competition and outflank them with future products. Microsoft is entrenched in the ACE group. It wouldn't take much to mislead that group (Compaq, DEC, mips, Silicon Graphics, and 60 wannabees). Just stalling on delivery of an operating system

would cost them millions.

Meanwhile, IBM has jumped into bed with Apple, which puts them in a great position to outmaneuver Apple. While IBM would never violate the confidentiality of its relationship, it could still give Microsoft specifications for future products that would make it obvious what Apple was doing.

2) The Bill "Machiavelli" Gates takes control of the industry theory. Bill Gates as the grand puppeteer has created a phony rift between the two companies for his own gain. First he grabbed control of MS-DOS away from IBM so Microsoft can sell it retail in the same way it made a killing with *Windows*. Then, to prevent meddling, IBM had to be removed from the picture. Microsoft did everything possible to goad IBM into a partnership with Apple, knowing that the inbred apparatchiks at IBM would never be able to work with the Apple executives. Both companies would spend a lot of money, and nothing would ever come from the IBM-Apple partnership. According to the theory, Gates somehow linked IBM and Apple through behind-

the-scenes manipulation of low-level executives.

3) The attempt to scare Intel theory. Microsoft has always been tight with Intel, and to get a head start on competitors, it's good to know the innards of the next-generation microprocessor. It's also important to know what the most popular microprocessors will be so you don't have to zig to, say, the RS6000 after you zagged to mips. But, Intel has not taken RISC seriously. While Intel has the resources to push its CISC chip architecture forward forever, its CISC design will always be challenged by one RISC chip or another. If Intel bit the bullet and went with RISC architecture, it would be hard to beat. The best way to force Intel to come to its senses is for Microsoft to join the ACE pact and get Apple and IBM to both choose RISC for its future architecture. Intel can't watch this happen without concern.

4) The Gates doesn't care theory. Bill Gates showed one interesting slide at his Comdex keynote last year—a flattened growth curve in the PC business. For Microsoft to continue to be "the hot company" it must continue to expand in a market that isn't growing. The operating system business was the

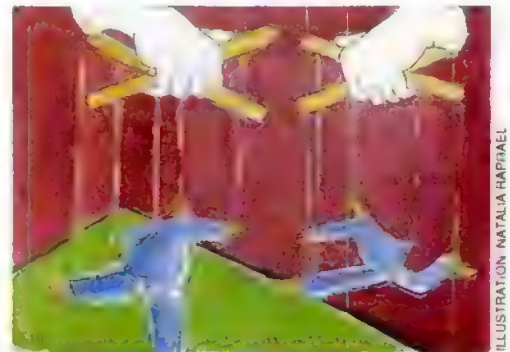


ILLUSTRATION: NATALIA RAPHAEL

reason Microsoft needed IBM. Now it can sell upgrades to the installed base of clones and IBM machines without IBM. Gates also knows that to continue growing, the company will have to sell applications into all market segments. This means competing directly with IBM. That's easier to do if your competition isn't in your home, affecting your decisions. This theory believes that Gates was honest in his assessment that the company is better off without IBM.



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Inside Track

It's not minor: this merger of **Digital Research (DRI)**, the one-time leader in operating systems before the advent of the IBMPC, with **Novell**, the leader in networking. When the deal was first announced, everyone took it lightly. DRI was coasting along at a piddling \$41 million in sales. A **pimple on the behind** of billion-dollar Microsoft. Hardly a concern in operating systems even though DRI took a technical lead from Microsoft with DR DOS 5.0. Microsoft, at the time, was scoring big with *Windows*. (Many of you recall the DRI attempt at a *Windows*-like OS—the decrepit but interesting *GEM* operating system used in the Amiga and once seriously promoted for the PC environment.) DRI had plenty of engineering and no marketing. Unlike Bill Gates, founder Gary Kildall decided to **enjoy life** while still young, and he went into semiretirement with his airplane and Lamborghinis. He never saw himself as a visionary in the way that Gates likes to see himself.

But while Microsoft struggled with IBM over complex OS/2 code, DRI had coders in England and elsewhere working on improvements to its clone of MS-DOS called DR DOS. It released its Version 5.0 long before Microsoft even began coding MS-DOS 5.0. Microsoft had to **match the features** list of DR DOS 5.0 and was in the unenviable position of playing catch-up. Meanwhile, as Microsoft **struggled** with Version 5.0 code, DR DOS 6.0 coding had long since begun. It's suspected that elements of DR DOS 6.0 are so **formidable** that its specifications and kernel may be the **triggering mechanism that prompted Novell** to do the deal. We may never know if all its features will ever see the light of day, but it's hard to imagine Novell not **exploiting** DRI engineering and using its own marketing prowess to go after Microsoft's systems business.

DR DOS 6.0 is rumored to have **completely broken the 640K barrier** and have true multitasking capabilities. It's almost an OS/2 in a DOS package.

Novell has never appreciated the fact that Microsoft, already the dominant systems and applications company, also went after the networking business with *LAN Manager*. Microsoft's **relentless** pursuit of market share and its need for **total domination** is something Novell cannot ignore. Since Microsoft owns the systems side of the equation, it has a **competitive edge** over applications and network software vendors. It could decide to **play games** with a new release of DOS, OS/2, or *Windows*. You know how that works. Add a little feature that just so happens to require *NetWare 386* to

be recoded, for example.

Novell can counter any such Microsoft ploy by **standardizing on DR DOS** and eventually

optimizing *NetWare* for DR DOS. Novell could require all of its customers to upgrade to DR DOS—**abandoning MS-DOS** completely. A recent IBM-Novell agreement makes the situation even more ugly for Microsoft. IBM could drop MS-DOS altogether just to **spite Microsoft**, if the Microsoft-IBM feud is for real.

Microsoft's stratagem will be to emphasize *Windows*, then roll-out a **Windows-specific/Windows-optimized DOS** version, and eventually bundle the two so *Windows* becomes the operating system. There will be no way to go from *Windows* to DOS because **there will be no DOS**. *Windows*, using all new code, will become the operating system and will break the 640K barrier, be multitasking, etc., etc. Hopefully, it won't even have to run DOS apps. By then there will be a *Windows* version of everything. This will be the GUI computer, the multimedia computer that **Gates rants** about. It will be its own platform.

The machines running in large corporations under the watchful eye of the network administrator will run DR DOS. Digital Research, in some weird way, will have **regained control** of the command line world. Bill Gates will salute them. He'll thank them for the personal 5 billion dollars he made **while they fumbled** ("So long, suckers!") and Gates will then go off into the GUI world that he's advocated for such a long time. *And* he'll go off with all

the monetary resources he'll need to do whatever he wants.

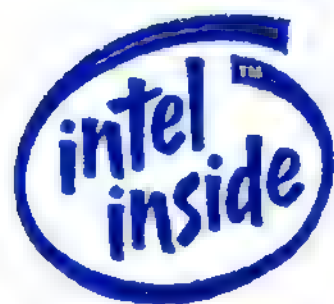
Who says the PC business is boring?

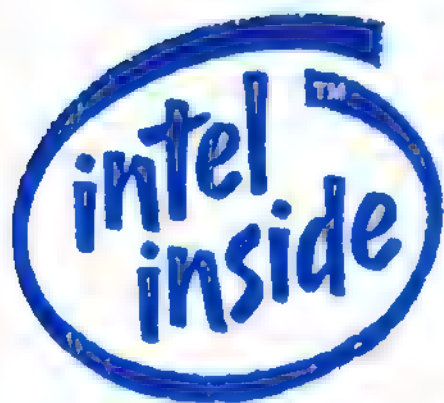
Genuinely Interesting Software Dept.: It's from Trans-Digital Corp. (14437 Catalina, San Leandro, CA 94577; 415-483-6400) and it's called *TRANS*. Using a **patented write-back engine**, this is unquestionably the **fastest** computer-to-computer file-transfer program you can find. If you hook two 386s together, then expect to transfer about 4 megabytes a minute. Faster machines will work even better, and the cable length can be 50 feet or more. It's pretty **phenomenal**. With *DESQview* you can have the process running in parallel to multiple machines. Sounds like a great cheap mininetwork, if you ask me. It requires a special provided cable and uses the parallel port in an unusual way. This technology could easily become the **performance standard** for people needing to hook a few machines together or for laptop users needing to plug into their desktop. It's a marvel and costs only \$129. Highly recommended. ■

Digital Research's
DR DOS 6 is
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PCM1015

Jim Seymour



2001: Software For A New Epoch

A look into the future reveals applications that seamlessly perform all the functions we want, even when we don't ask for them.

A lot of us who have been around this business since before IBM ever thought of producing a "personal" computer, find ourselves in a particularly ruminative mood these days. This fall marks the tenth anniversary of IBM's first PC. No doubt you'll be seeing a lot of misty-eyed "how it was in the old days" columns over the next few months.

I'll leave that revisionism to the historians. This issue and next, I'd like instead to look *ahead* ten years, to the kind of software we'll be using on the twentieth anniversary of the first IBM PC—and what we'll be doing with those PCs.

There is an inevitability to the development of PC hardware. We know about the plans from Intel and others for new chips. We know about flat-panel displays. And we

know about voice- and handwriting-recognition and other technologies likely to be in place ten years hence. What we *do* with all that hardware is the more interesting, less certain question—and that means the software that runs on them.

By the time the twentieth anniversary of the introduction of the PC rolls around, applications software won't look much like what we saw in 1981, nor in 1991 for that matter.

Why? It'll be modeless. And fast. And smart. And damned big.

Of all those "new looks," none will be so important as getting away from the mode-based operation of present-day applications.

What? No modes? Isn't that a war we won almost ten years ago, not so long after the PC was rolled out?

Early applications for what was known then as PC-DOS were infuriatingly "modey." The first word processor for the PC, for example—an abomination misnamed *EasyWriter*, long since forgotten by most of those poor souls who tried it—was strictly mode-driven. You entered text in one mode; then you flipped to the program's other face to *edit* that text. Want to enter more text? Fine. Flip back

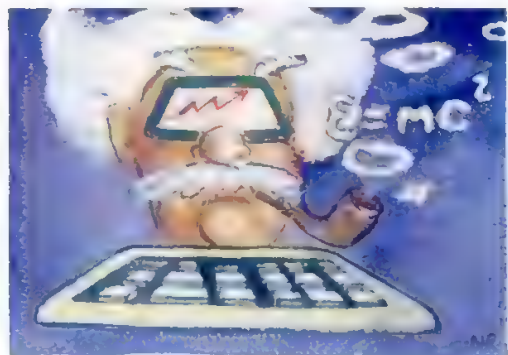
to the program's text-entry mode.

Today that sounds crazy, and it is. Entering text and editing text in a word processor ought to be a single, seamless function.

More modes? PC word processors (and many of their predecessors on other platforms) had separate text-editing and text-formatting modes. You typed in your material in the former, then flipped or even reloaded the program to get to its text-formatting mode.

That kind of arbitrary division between input and output or between entry and editing, reflected an older and far clumsier approach to computers, a relic of the days when computer software was used only by the programmers who'd written it.

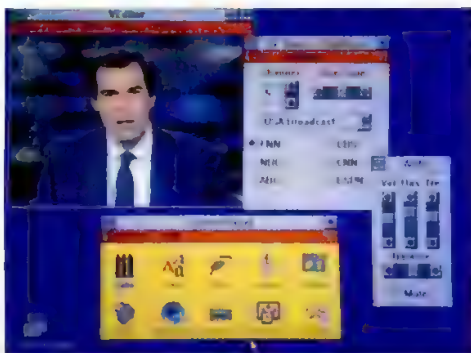
When we got rid of the *EasyWriters* of the world, we thought we'd shed the burden of mode orientation in PC applications. But we were fooling ourselves. *Lotus 1-2-3*, for example, couldn't print graphs from within the program, but only after you exited it and loaded its PRINTGRAPH utility (read: mode). *Harvard Graphics* users couldn't create a graph then annotate it in one screen; they had to get the bars, lines, and pie wedges right first, then flip to a special annotation feature (read: mode). And on and on.



We've accepted a more subtle but no less foolish and obnoxious level of mode-based operation in programs that even today are big sellers and widely adopted standards. By 2001, not only will individual programs be free of this maddening mode orientation: The entire suite of programs we use will begin to appear and work largely as one entity.

We see the faintest glimmers of that now.

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Jim Seymour

Ami Pro and Excel 3.0, for example, let you use drawing tools directly, to annotate, decorate, or desecrate your work—within those programs themselves. And Windows, for all its warts, is a first feeble step toward cross-application modelessness. Today we still have to switch from one program to another within Windows—so it's not there yet. But future versions of Windows (under whatever name) will increasingly swallow up and integrate individual applications as we install them. They will appear to us as parts of a seamless whole.

BIGGER, FASTER, AND SMARTER

Beyond modelessness, raw speed may be the next most-important change in PC applications. With RAM cheap and plentiful, our PCs will have 100MB or more RAM. So no matter how big programs grow (keep reading), we'll be able to load all of our basic applications into RAM at once. And very large RAM caches will swallow up the data we're working with. The result? Very fast program execution.

Living within the constraints of limited and (until recently) segmented memory has forced programmers into performance-hobbling tricks to conserve memory. Without those constraints, and on the flat memory-model-based RISC chips we'll be using in 2001, apps will run far faster than anything we see today.

Limited memory has also kept programmers from producing truly smart applications. Even the best of today's applications are still pretty dumb. We've worked through the era of WYSIWYG software; now we're moving into the DWIM-programs epoch: the Do What I Mean apps. And software smart enough to zig when we want to zig—even though we tell it to zag—gobbles memory.

Which leads to the last of my four characteristics of PC applications a decade hence: truly massive programs. If you think software that demands 512K is big, wait till you start putting apps on your gigabyte-sized hard disk that need three or four megabytes of RAM—or five or ten—to run.

Next time, I'll look at how truly smart, integrated software will work for us a decade hence, finally delivering on that "working smarter" promise so often heard today.

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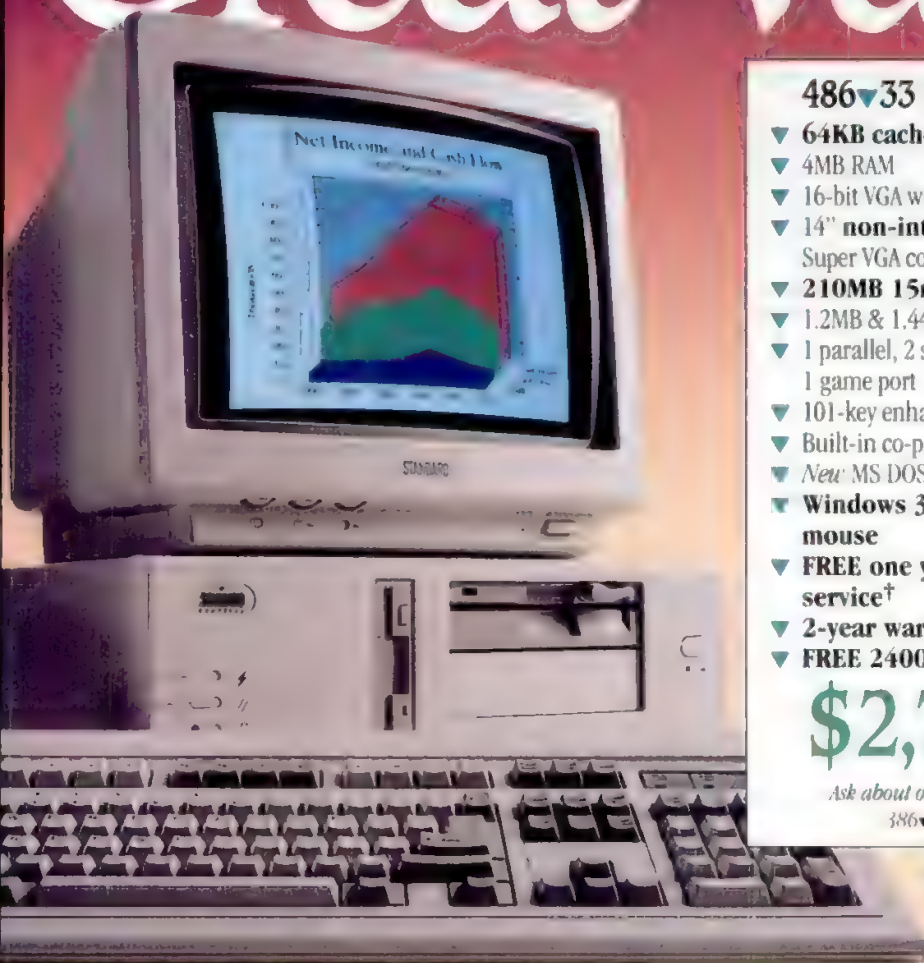
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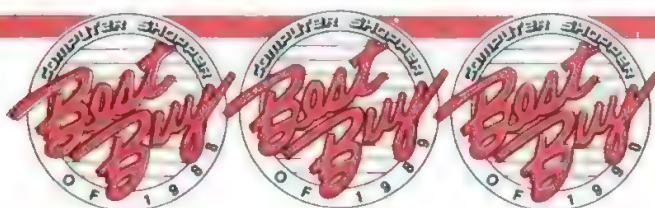
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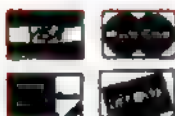
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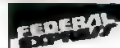
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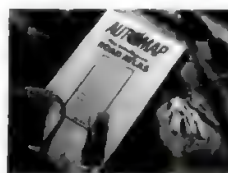
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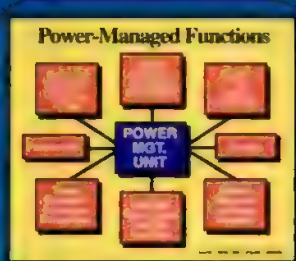


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William F. Zachmann



Portable May Not Be Practical

In theory, portable operating systems seem like a great idea. In practice, they raise some very thorny issues.

Are portable operating system environments soon to replace hardware-specific architectures? Will these portable operating systems open the door for newer, RISC-based microprocessors to replace the Intel X86 architecture on the majority of office desktops?

It seems possible, especially when you consider all the attention that portable operating systems have been getting lately. Microsoft's "portable" or "new technology" version of OS/2 (OS/2 3.0) is a prominent element of the Advanced Computer Environment (ACE) initiative backed by Compaq, DEC, Microsoft, MIPS, and others. And the "new open system platform," stated as the primary objective of joint development in the recent Apple/IBM letter of intent, also looks a lot like a portable operating system.

Even if "portable" operating systems become a major trend in personal computing, chances are that—at least for the next few years—they will have only a minor impact. First of all, any effort to develop software of greater generality tends to involve a performance tradeoff, especially when compared with more specifically targeted software.

To create a "portable" OS environment it is necessary to define key interfaces at a level of abstraction that insulates them from any specific hardware implementation. That "insulation" layer will almost always require more code and longer instruction paths than do hardware-specific operating systems.

Second, any new "portable" OS cannot simply define critical interfaces using a "blank page." Conformity to many de facto standards is required to meet the needs for forward compatibility with existing software and with existing networking environments.

Third, no matter how successful the effort to create portability may be, applications software portability will remain limited in significant ways. Actual executable program code necessarily remains specific to some particular processor architecture. Different display, disk, communications, or other controllers require specific software at times, even in the

very well-defined world of IBM and compatible personal computer systems. Magnify these problems across multiple systems with different microprocessor architectures, different bus structures, and other basic design differences, and portability gets very complicated indeed.

Were there as much "magic" in portable operating systems as the recent hype suggests, then Unix, one of the oldest attempts at portability, would already have done the job and become the dominant standard. That it hasn't done either after almost two decades should make us wary of the claims made for other would-be "portable" OS environments.

One can assume that merely by providing access to newer RISC-based systems, efforts toward portability are assured of success. If that were so, then Unix ought to be further along than it is. And RISC architectures have yet to provide a real challenge to Intel 386- and 486-based systems when it comes to effective price/performance for ordinary office tasks.

The "need" to migrate to alternative microprocessor architectures is, in any case, felt more by Intel's competitors, by hardware vendors trying to avoid commodity-like competition, and by would-be purveyors of "port-



ILLUSTRATION NATALIA RAPHAEL

able" software than it is by users. As long as Intel architecture systems remain competitive on a price/performance basis, a move to other system architectures promises users little beyond major migration headaches.

I don't rule out the possibility that efforts to create "portable" OS environments may eventually succeed. But if I were responsible for my organization's personal computer use, I certainly wouldn't spend a lot of time thinking about them. ■

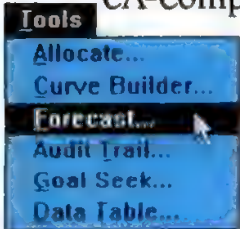
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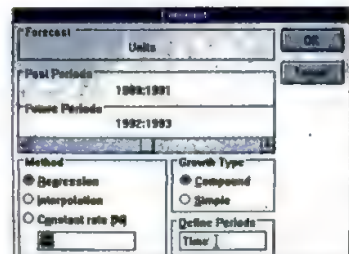


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of Goods Sold	\$24,314	\$18,476	\$5,838
g & Admin.	\$4,855	\$5,074	(\$219)
Cost	\$29,168	\$23,549	\$5,619
	\$19,381	\$18,731	\$650

	Actual	Plan	Variance
	23,597	26,100	(2,503)

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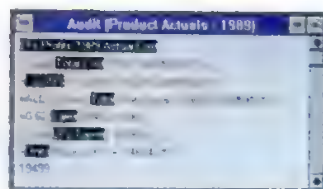


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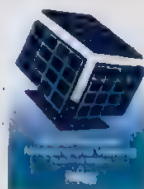
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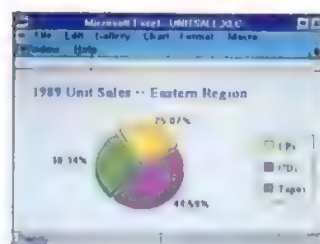
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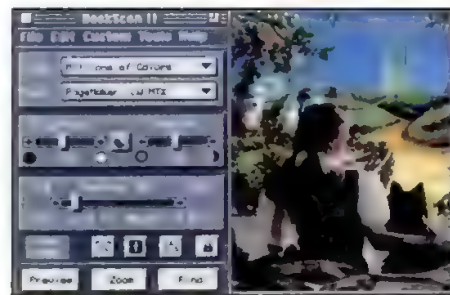


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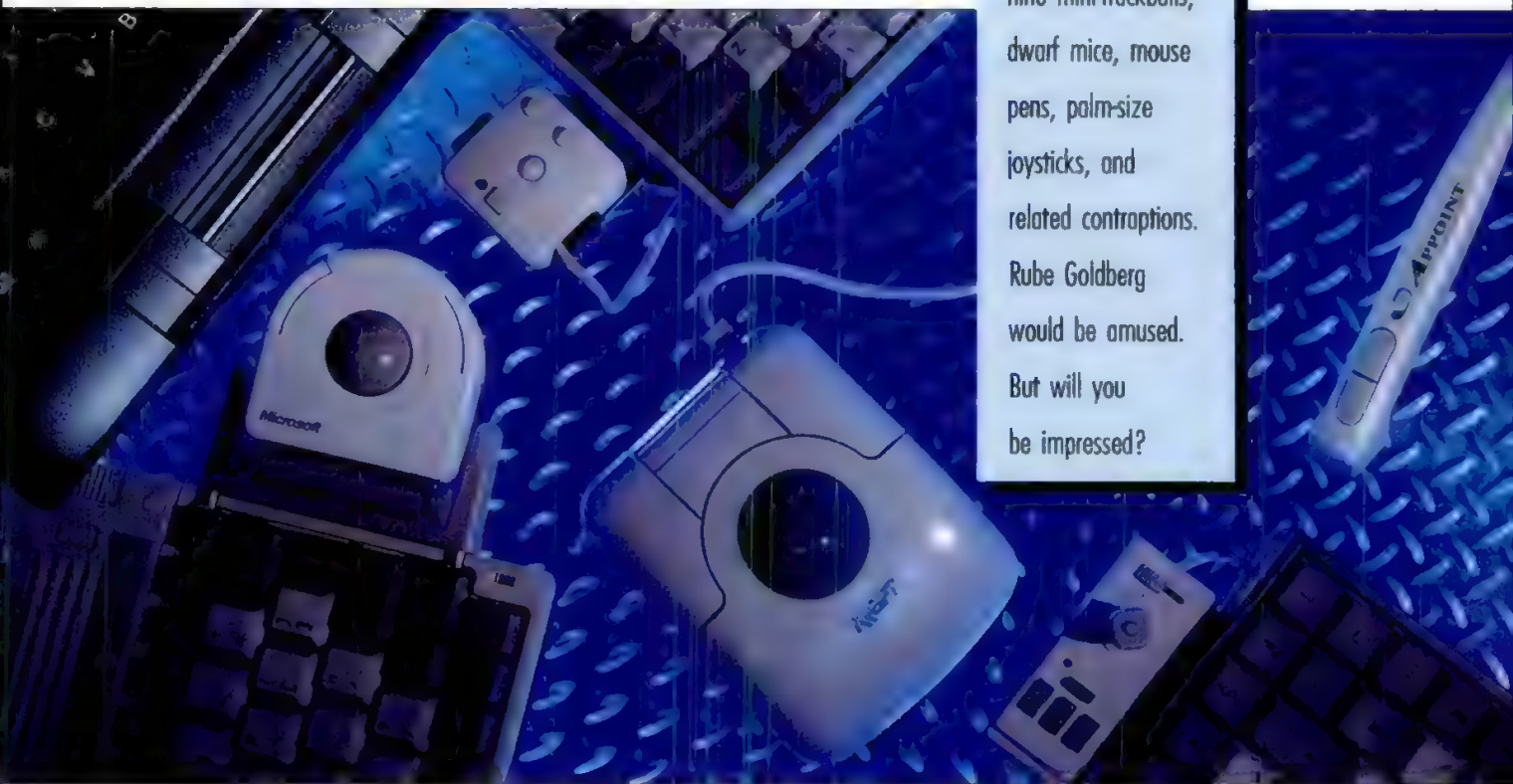
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FIELD MICE

Different, Yes.
Better, Maybe.

Laptop-toting road warriors want something smaller than desktop mice, with shorter cords. Enter the portable pointing device. PC Labs tests nine mini-trackballs, dwarf mice, mouse pens, palm-size joysticks, and related contraptions. Rube Goldberg would be amused. But will you be impressed?



Who says the computer industry doesn't have a sense of humor? Just take a gander at some of the mouse alternatives that have become available for users of laptop and notebook computers. They're—well, different. Quirky.

The category known as *portable pointing devices* evolved because of low-level dissatisfaction with mainstream desktop devices such as the Microsoft and Logitech mice. Some laptop users find them

BY BILL HOWARD

bulkier than necessary and the cords far too long. When you fly coach and your laptop covers the entire tray table, there's also the issue of where to roll the mouse.

Over the past year, more than a half-dozen companies have developed alternatives to the mouse that are highly individualistic, to put it mildly. In this article, we test nine such devices. Four are trackballs ranging from tiny (Appoint's Thumbelina) to portable-size (Logitech's TrackMan Portable and Microsoft Corp.'s BallPoint Mouse) to too big (Kraft Systems' TopTrak). One is a combination trackball/mouse (IBM Corp.'s IBM PS/2 Trackpoint), one is a mouse in the shape of a pen (Appoint's MousePen Professional), one is a downsized joystick (Suncom Technologies' ICONtroller), one is a smallish traditional mouse (Mouse Systems Corp.'s The Little Mouse/PC), and one is a built-in device (GRiD Systems Corp.'s GRiD IsoPoint).

The five trackballs and two other devices (GRiD IsoPoint, ICONtroller) are

stationary; you do not have to clear space so that you can roll or drag them on a tabletop. Six of the nine can be attached to your PC (Thumbelina, TopTrak, TrackMan Portable, BallPoint Mouse, ICONtroller) or are built in (GRiD IsoPoint). All except the TopTrak have cords shorter than the typical Microsoft or Logitech desktop mouse. And all except the TopTrak, the IBM PS/2 Trackpoint, and The Little Mouse/PC are smaller than a desktop mouse.

Microsoft's and Logitech's offerings are likely to be the standards against which portable pointing devices are measured, because the companies dominate the world of desktop mice and because of the similarity of their laptop products: mini-trackballs that clip onto the side of your laptop.

TOO UNUSUAL?

The majority of the designs are unusual, especially if your familiarity with point-

ing devices starts and ends with the traditional desktop mouse. Appoint offers products more thoughtfully designed than other unconventional devices: MousePen Professional and Thumbelina, a trackball just 1.6 inches square. Thumbelina is small enough that it could be built into a laptop computer. But other devices are so unusual that you may have trouble taking them seriously as portable pointers:

■ The Kraft TopTrak is a desktop trackball (read: bulky) with an 8-foot cord. Kraft pitches TopTrak for portable use because of its low-current design, but that's of little importance, since most pointing devices work well with both desktop and laptop PCs and have minimal current drain.

■ The Little Mouse/PC, from Mouse Systems, is indeed significantly smaller than a Microsoft or Logitech mouse, but it's an optical design, which means you have to lug around (and not lose) a 7- by 8-inch mirrored pad. A minimouse remains a great idea, perhaps an obvious idea waiting to be implemented, but not if it's optical.

■ The IBM PS/2 Trackpoint is so wobbly as a mouse that most users will find it functional only as a trackball.

OTHER PRODUCTS

To be included in this review, the pointing device had to be designed for on-the-go use with a portable computer and available by early summer 1991. For earlier reviews of 58 desktop mice, trackballs, and light pens, see "Mice and Trackballs: Choices for the New Generation of Applications" (*PC Magazine*, August 1990).

Additional portable pointing devices should be available now or by year's end. GEC Plessey Semiconductors (516-293-8636, formerly Marconi Circuit Technology) plans a sub-\$150 Microsoft Mouse-compatible ballistic trackball called LT that can be held by hand or clipped to a laptop; the ball functions as a mouse button when you tap or click it. If you need a portable tablet for CAD, consider GridMaster (\$449 to \$469) from Numonics Corp. (800-247-4517 or 215-362-2766), a roll-up 17- by 15-inch tablet with a stylus pen or four-button cursor (mouse). It's intended to be readily portable but is probably too bulky to use while in transit.

Veridata Research (818-303-0613) sells



EDITORS' CHOICE

■ Four maybes, no winners

The portable pointing device market is evolving; most products would benefit from further development. Of the nine devices we tested, you're likely to find that one of these four suits your needs: Appoint's MousePen Professional, Appoint's Thumbelina, Logitech's TrackMan Portable, and Microsoft's BallPoint Mouse. Given the personal nature of the devices and the rough edges, none of them earn Editors' Choice this time around. For now, they are all honorable mentions.

MousePen Professional, \$99, comes closest to duplicating the feel of a mouse in the shape of a pen. This is the best choice if you want a mouse but don't want the bulk of a mouse—until some company wakes up and builds a half-size mouse for portable use. Thumbelina, a \$99 trackball, only 1.6 inches square and with barely any height at all, would be excellent for running presentations where you click the left and right

buttons to control slide shows.

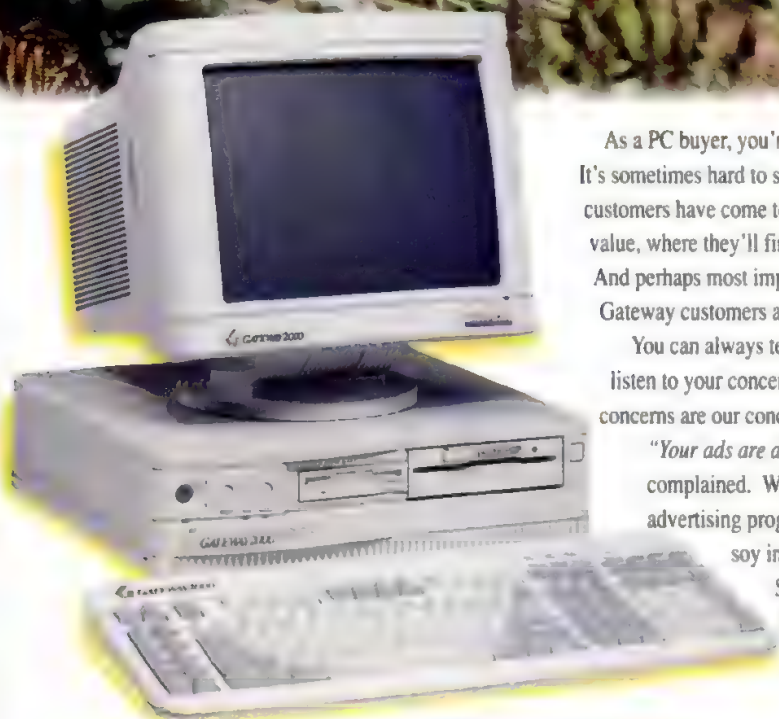
The Microsoft and Logitech trackballs are more similar than different. They are relatively expensive (\$175 and \$169, respectively). Their installation and removal could be smoother. TrackMan Portable works only at a fixed angle; BallPoint Mouse will not let you close the cover of your laptop. But once you adjust to how a trackball works (particularly when dragging an object), you'll have no problems with either one.

Of the remaining products, Kraft Systems' TopTrak trackball is too big, Mouse Systems' The Little Mouse/PC requires a bulky optical mouse pad, and the IBM PS/2 TrackPoint reversible trackball/mouse is bulky and somewhat hard to use as a mouse. Joysticks have not caught on, except for games, but if you like them, you'll like Suncom Technologies' midget ICONtroller. The GRiD IsoPoint, the built-in rolling, sliding pointer, is an acquired taste.

Which PC
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It's literally a jungle out there at the Organization for Tropical Studies (OTS), a consortium of 52 prestigious universities and research institutions. OTS uses Gateway 2000 systems in Costa Rica to do research in tropical rain forests. Don Stone, OTS's

Executive Director, decided to put Gateway computers in the jungle after confirming their great

value and reliability with Susan Gerbeth-Jones, Data Processing Specialist at Duke University, one of OTS's member institutions. Don asked Susan if she had ever heard of a company called Gateway 2000, to which she replied, "Why, yes I have - here's one right here." Susan said she's had her Gateway at Duke for over a year. "Everything about it is solid and it runs smoother than any other computer in the department," she commented. "I feel Gateway 2000 has more features for the money."



Susan Gerbeth-Jones
Duke University

GATEWAY

— BECAUSE WE'VE STOOD —



Gateway 2000 has stood the test of time. *PC Week's* Sam Whitmore includes Gateway 2000 in a very short list of successful computer makers. "The common themes: high-value, low-cost products. Close contact with customers. *And sincerity over time.* Buyers value vendors that have priced their products fairly from the outset, not just in reaction to dwindling market share and impractical cost structures."

We know you also value a vendor's stability over time. A dentist from Watertown, South Dakota, wrote to us recently for assurance that his Gateway computer won't become an "orphan" someday. Nobody wants to buy a PC today and find out tomorrow the manufacturer went out of business.

When you buy a Gateway 2000 computer, you can be assured that you're doing business with one of the largest and most successful PC direct marketers in the nation. In the July 1 issue of *Business Week* magazine, Gateway is ranked as the third largest direct market computer manufacturer in the nation based on 1990 revenues of \$275 million. In just two quarters of 1991, we've nearly exceeded 1990 revenues. Many

AY 2000

THE TEST OF TIME



companies would envy our June 30 balance sheet, which shows current assets outweighing current liabilities by more than 2 to 1 and our equity being more than 10 times our long-term debt.

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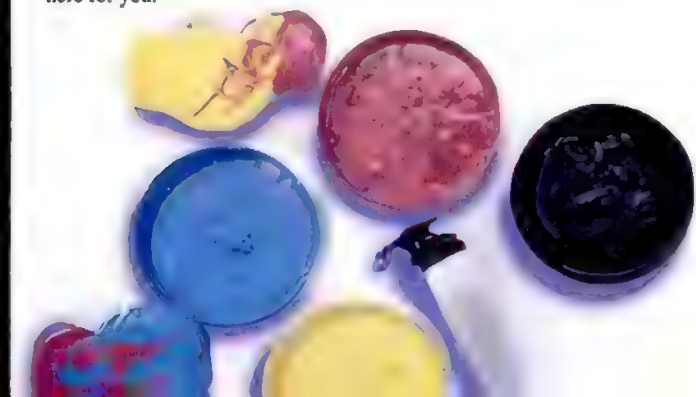
Gateway 2000 has stood the rigorous tests of Time Customer Service in Tampa, Florida.

TCS now has over 250 Gateway systems in use. Some of the Gateways are used in mission critical business applications such as Target Select. Target Select is a process whereby a magazine is built and customized with inkjet printing at bindery time. But TCS's Andy Rifkin, Director of Advanced Technologies, didn't buy all those Gateways without careful consideration.

"We use Gateways in mission-critical applications," said Andy. "If the systems running our application go down, we're out of business. That's why we do extensive testing before we buy. We have at least one PC from every computer company ever in existence," he continued. "These systems have all been through our testing process, but the Gateways have unquestionably been our top-performing PC's with a failure rate less than 2%."

Andy said initially it was risky for him to recommend Gateway 2000 over the more traditional corporate computer suppliers. "But Gateway came through for Time Customer Service, at a fraction of what we had been paying for PC's."

*Andy Rifkin
Time Customer Service*



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Gateway 2000's tireless efforts to offer the best value in the industry convinced the world-famous Piorelli® Armstrong Tire Corporation to buy Gateway computers. "They never raise their prices," said Gary Boyd, Controller for Piorelli, from his office in Hanford, California. "Gateway is continually improving the quality of

their products and services, and yet their prices keep going down."

Piorelli uses Gateway systems in every department. "The engineers in particular love them," Gary commented. "They run Gateway 486 systems as CAD workstations to design products, equipment and plant facilities."

Piorelli people are taking Gateway systems home with them, too. Last year the company hosted a computer fair to give employees a chance to compare various computer brands on the market. "Our factory manager bought a Gateway for home, as did the manufacturing manager, four of the engineers and myself, just to name a few," said Gary. "Even with all the competition at the fair, Gateway 2000 clearly offered the best value."



Gary Boyd
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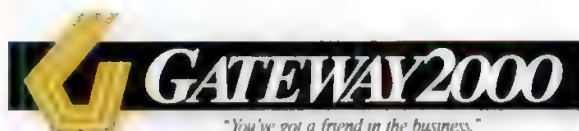
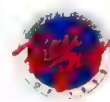
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the ExecuLite 386 notebook with an optional slide-in 2- by 2-inch touch pad. The pad works with a tiny stylus that looks like a guitar pick. In a pinch, you can use your finger. Commax Technologies (408-435-5000) sells a variant called the UltraThin 386SX. Olivetti (908-526-8200) also has a line of five notebook and laptop computers with touchpad technology.

Other pointing device technology that may find its way into laptops includes MicroTouch Systems' UnMouse, a pressure-sensitive 3- by 4-inch glass plate with a stylus; Home Row's Push-n-Point, a flexible J key that functions as a miniature joystick; and Key Tronic Corp.'s KeyMouse, also a built-in joystick work-alike. The KeyMouse is located to the right of the space bar; sensors determine direction and velocity. The F and D keys on the keyboard act as primary and secondary mouse buttons, respectively, and Ctrl-Space controls cursor speed. We tested a demonstration version of KeyMouse; our first impression was that it is awkward to aim and control. We found it especially difficult to hold the mouse pointer in position while double-clicking. A Key Tronic spokesman said the G key will be used for double-click functions on future models.

BUYING CONSIDERATIONS

Because the choice of a laptop pointing device is so highly subjective, you should use our reviews as a starting point; what's comfortable for one user may be awkward for another. Other issues may factor into your buying decision: Not all clip-on devices will clip on to every laptop, and some that do may block the floppy disk drive or the display controls. Trackballs should have a drag-lock feature that toggles the button on and off because holding down the primary button while you move the ball is awkward. You'll want a short cable (3 feet or less); anything longer gets in the way. Most cables have DB-9 serial connectors. The two Appoint products and IBM have round PS/2 mouse connectors; most products also have DB-9-to-PS/2 or PS/2-to-DB-9 adapters. If you have to use the adapter, expect the connector to stick out 2 inches from the back of your laptop.

200-point-per-inch resolution allows greater precision in selecting objects; 400 ppi requires less motion to move the mouse across the screen. The majority can use the ubiquitous Microsoft Mouse driver, although they may also have a proprietary

driver for variable sensitivity (resolution) and ballistic tracking.

Prices range from \$89 (TopTrak) to \$169 (TrackMan Portable) and \$175 (BallPoint Mouse), although the two most expensive products will also be the most widely available and probably the most heavily discounted.

FIXING WINDOWS

Portable pointing devices are a necessity if you're running *Microsoft Windows 3.0* on your laptop, but you're likely to have trouble seeing the small mouse cursor on-screen. AT&T wisely modified the version of *Windows* included with its Safari notebook computer to enlarge the cursor and the I-beam (which marks your current position in a file). Microsoft says that an upgraded BallPoint driver (which also works with the Microsoft Mouse) due by summer's end will include an enlarged-cursor option. You may want to consider one of several *Windows* cursor-enhancement utilities. *Magic Cursor!* (\$79.95, Fanfare Software, 818-886-8787) is robust but expensive. Cheaper alternatives are available on bulletin boards and on PC MagNet. On MagNet, go to the Utilities Forum, Library 10 (Windows), and browse for the keyword CURSOR. You will find NEWCSR (free), BCURSOR (free), and CHGCUR (shareware).

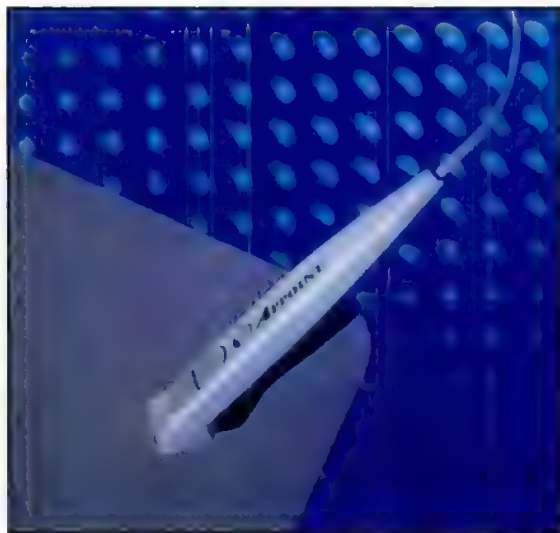
Additional research and reporting by Eric Berlin and Robin B. Bornstein.

APPOINT MousePen Professional Thumbelina by Robin B. Bornstein

Appoint offers two of the more unusual and useful portable pointing devices in this roundup. The MousePen Professional is a thick plastic mouse pen with a pearl-size roller-ball tracking mechanism in the tip and two buttons set into the barrel. Thumbelina is a dwarf trackball with the same tiny roller set into a housing the size and shape of a small pill box.

Both are \$99, both are Microsoft

Mouse-compatible, both provide ballistic tracking variable from 150 to 1,000 ppi (points per inch), and both come in portable (45-inch cord) and desktop PC or Macintosh (8-foot cord) versions. Both use the round serial connectors used by IBM on its PS/2s and adopted by a small but increasing number of laptop makers.



Appoint's MousePen Professional, \$99, looks like a pen and works like a mouse.

Both also have PS/2-to-DB-9 (and PS/2-to-DB-25) adapters for connections to the more common 9-pin serial ports.

MOUSEPEN PROFESSIONAL

The MousePen Professional functions exactly as you would expect a device that's a cross between a writing pen and a mouse to function. It's especially good for design and drawing operations, but free-hand drawing (especially signing your name) can be awkward compared with a real pen. MousePen Professional lends itself to click-and-drag functions, with the primary button (the left button on a mouse) located near the base, where your index finger rests. Above that is the second (right) button, and above that a switch that lets you choose fixed or variable (ballistic) resolution.

The MousePen Professional needs a working space 3 inches square; in a pinch that can be your leg. You may find a few smooth surfaces where the unit doesn't track well. (To improve the tracking, one *PC Magazine* editor replaced the Delrin plastic ball with a steel ball bearing.) While typing, you may be able to hold the MousePen Professional between your thumb and finger. The cord sticking out of

COVER STORY

PORTABLE POINTING DEVICES

the top is a slight impediment to free movement of the pen, but you'll get used to it. All in all, this is a well-designed portable pointing device.



THUMBELINA

At 1.6 inches square and little more than half an inch high, Thumbelina is an excellent choice for users partial to trackballs and for those who need a pointing device that does not take up much storage or desk-top space. You can hold it in your hand as you would a stopwatch, attach it to your computer with Velcro, or attach it with a Z-shaped

Appoint's Thumbelina, \$99, is a tiny trackball (1.6 inches square).

bracket (supplied). Don't let Thumbelina's 0.4-inch-diameter Delrin trackball fool you: A small spin moves the on-screen pointer a good distance. A filtering system eliminates "mouse jitter"—unwanted cursor movements sometimes caused by hand twitches or even a bumpy train, plane, or bus. In addition to the roller ball and left and right buttons, Thumbelina includes a drag-lock button. The cord attaches at the front of Thumbelina; it should attach at the rear. (If you turn Thumbelina so the cord sticks out the back, the screen pointer moves up when you move down, and vice versa.) Thumbelina would be an especially good choice

PORTABLE POINTING DEVICES: SUMMARY OF FEATURES

Products listed in alphabetical order by company name

	Appoint MousePen Professional	Appoint Thumbelina	GRID Systems Corp. GRID IsoPoint	IBM Corp. IBM PS/2 Trackpoint	Kraft Systems Inc. TopTrak
List price	\$99.00	\$99.00	\$5,095.00 (as part of GRIDCase)	\$159.00	\$89.95
HARDWARE FEATURES					
Type of device	Optomechanical mouse	Optomechanical mouse	Mechanical mouse	Optomechanical trackball/mouse	Optomechanical trackball
Connector	PS/2	PS/2	None	PS/2	DB-9 serial
Additional connector (adapter)	DB-9 serial	DB-9 serial	N/A	None	DB-25 serial
IRQs supported	3, 4	3, 4	3-5	None	3, 4
Base hardware resolution (points per inch)	150	150	450	200	200
Composition of ball	Delrin	Delrin	N/A	Phenolic	Phenolic
Ball removable for cleaning	■	□	N/A	□	■
Method of attaching device to laptop	N/A	Z-bracket	Built-in	N/A	N/A
BUTTONS					
Unduplicated	2	2	2	2	2
Total	2	2	4	4	2
Drag-lock	None	1	None	2	1
Other switches	Fixed/ballistic	None	None	None	Simultaneous left/right
PHYSICAL SPECIFICATIONS					
Length of interface cable (inches)	56	45	N/A	44	95
Weight (ounces)	2	2	N/A	5	11
Ball diameter (inches)	0.4	0.3	N/A	1.3	1.5
OTHER FEATURES					
Size of CONFIG.SYS device driver	15K	15K	14K	N/A	10K
Size of command line driver	15K	15K	14K	14K	10K
Disk format of supplied drivers	5.25-inch, 3.5-inch	5.25-inch, 3.5-inch	3.5-inch	3.5-inch	5.25-inch, 3.5-inch
Version number of tested driver	2.00	7.04	7.4	7.04	6.24
Driver can be disabled from DOS	■	■	■	■	■
Driver supports ballistic tracking	■	■	■	■	■
AutoCAD driver	┘	┘	┘	┘	■
Resolutions supported (points per inch)	150-1,000	150-1,000	100-1,000	N/A	10-1,150
Other mouse emulations included	None	None	None	Microsoft	Microsoft
Software bundled	None	None	None	None	LCS's Telepaint

■—Yes

┘—No

N/A—Not applicable: The product does not have this feature

Thumbelina is a good choice for laptop users who want a mouse to control a presentation.

for laptop users who want a mouse to control on-screen presentations.

Philips Consumer Electronics Co. bundles MousePen Professional with its

286-based Magnavox laptops sold in the United States.

MousePen Professional Thumbelina

Appoint, 1332 Vendels Circle, Paso Robles, CA 93446; 800-448-1184, 805-239-8976. **List Price: \$99. In Short:** The MousePen Professional is a mouse in the shape of a pen. Thumbelina is a pea-size trackball in a 1.6-inch square case. Both are Microsoft Mouse-compatible and have ballistic tracking. Despite the MousePen Professional's shape, mouse users find they use the

same gestures and motions as they do with a mouse. Thumbelina is the most compact portable pointing device yet. It has a bit of a learning curve unless you've used trackballs before. Laptop users should specify the portable versions with 3.5-foot (instead of 9-foot) cables.

CIRCLE 544 ON READER SERVICE CARD

GRID SYSTEMS CORP.

GRiD IsoPoint

by John R. Quain

Much-publicized for years but never actually built into a laptop until late 1990, the GRiD IsoPoint is very much an acquired taste. Users may love or hate IsoPoint, a solid straw-shaped shaft set into the very front of a portable computer, parallel to the Spacebar. You roll the shaft front-to-back and slide it left and right to move the mouse cursor around the screen.

The only real design restrictions are that IsoPoint must be built in, not added on, and that the keyboard must be set back



The GRiD IsoPoint, a straw-shaped, rolling, sliding shaft, is built into the keyboard of the GRiDCase 1550SX.

about an inch from the front edge of the laptop case. The IsoPoint's rolling shaft is less than a quarter-inch in diameter and about 2.8 inches long. Two buttons flank each side of the shaft. The inner buttons act as the main (left) mouse buttons, the outer buttons as the secondary (right) mouse buttons. You can also click on the bar itself, although doing so without simultaneously moving the cursor is difficult. Using your thumb, you roll the bar to move the cursor vertically, and slide the bar from side to side for horizontal con-

Logitech Inc. TrackMan Portable	Microsoft Corp. BallPoint Mouse	Mouse Systems The Little Mouse/PC	Suncom Technologies ICONTroller
\$169.00	\$175.00	\$134.95	\$99.95
Optomechanical trackball DB-9 serial DB-25 serial 3, 4 200	Mechanical trackball DB-9 serial PS/2 All (0-15) 400	Optical mouse DB-9 serial DB-25 serial, PS/2 2-15 300	Mini-joystick DB-9 serial DB-25 serial 3, 4 (approximately) 200
Polycarbonate ■ Detachable clip	Compression- molded plastic ■ Detachable clip	N/A N/A N/A	N/A N/A Duo-Lock
3 3 2 None	2 4 None □	2 2 None □	3 4 1 Resolution, compatibility, joystick button
26 4 1	52 (coiled) 6 1.1	70 5 N/A	36 (coiled) 3 N/A
16K 34K 3.5-inch 6.0 ■ ■	N/A 16K 3.5-inch 1.00 ■ ■	13K 12K 5.25-inch, 3.5-inch 7.01 ■ ■	13.5K 13K 5.25-inch, 3.5-inch 1.00 ■ □
□ 50-10,000 Microsoft Windows hotkeys	□ 0.75-22,400 None Mouse menus	□ 300-30,000 Microsoft, PS/2 Pop-up menus, utilities	□ N/A Microsoft Testing and tutor programs

COVER STORY
PORTABLE POINTING DEVICES

IBM CORP.
IBM PS/2 Trackpoint

by John R. Quain

Of all the portable pointers in this roundup, the \$159 IBM PS/2 Trackpoint is the only device that's both a trackball and a mouse. Conceptually, that's admirable. The 6-



Flip over the IBM PS/2 Trackpoint, \$159, and it switches from mouse to trackball.

ounce device can be used as a trackball when you're limited to an airplane tray table; it converts to a mouse when you have a desktop to work on. But as with many two-in-one solutions, it's less capable than single-purpose mice or trackballs. Of the two implementations, the trackball mode is more workable.

Introduced in March with IBM's PS/2 L40 SX laptop, the clam-like Trackpoint is a 200-ppi optomechanical system with a round PS/2 connector. The Trackpoint bears a rough family resemblance to IBM's four-and-a-half-year-old PS/2 mouse. At 4.5 inches long by 2.5 inches wide, it's a bit bulkier than a standard mouse. As a trackball, the Trackpoint has four buttons situated around the 1.2-inch-diameter ball: two small drag-lock buttons above the ball, two large click buttons below it. Depress two plastic braces, pull up on the hinged top so less of the ball sticks out, flip it over, and you've got a mouse. The two rubber-like feet that keep it steady as a trackball become the left and right mouse buttons. Unfortunately, enough of the ball still protrudes so that the mouse remains a bit wobbly, making for sloppy cursor con-

trol. The design also means that the ball cannot be removed for cleaning.

The Trackpoint's software driver proved to be one the smoothest trackball operators in *Windows'* Paintbrush, providing steady and consistent control. Users can set vertical and horizontal sensitivity using command line switches, as well as selecting four levels of acceleration: slow, medium, fast, or none. On the downside, the package has no auto-install program or CONFIG.SYS driver, and the command line driver uses 32K of memory, more than twice as much as most other drivers.

IBM PS/2 Trackpoint

IBM Corp., 1133 Westchester Ave., White Plains, NY 10604; 800-426-9292.

List Price: \$159. **In Short:** The PS/2 Trackpoint is a bulky, boxy mouse that becomes a trackball when flipped upside down. The trackball mode is the more successful of the two; the mouse is unsteady and a bit hard to maneuver. It's a great idea, imperfectly executed.

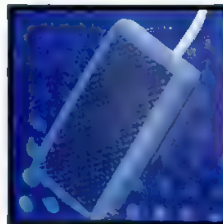
CIRCLE 546 ON READER SERVICE CARD

KRAFT SYSTEMS INC.

TopTrak

by Eric Berlin

Kraft Systems says that its \$89.95 TopTrak trackball merits consideration as a portable pointing device because of its low current requirements. You certainly wouldn't choose TopTrak because of its size. At 2 by 3.8 by 4.5 inches (HWD), it's roughly four



Kraft Systems' TopTrak, an \$89.95 trackball, is too big for serious use with a laptop, even without the optional \$10 foot pedal that duplicates the left button.

trol. There is just enough leeway in the bar's physical sideways motion to move the arrow from one side of the screen to the other.

Once you grow accustomed to its interface, you can use the IsoPoint to move the cursor without lifting your fingers from the keyboard. The tricky part is using drawing and paint packages. In its default mode (450 ppi), the IsoPoint zips the cursor around a little too quickly for some tastes, but its sensitivity and acceleration (or ballistic tracking) can be adjusted from the DOS command line or with a TSR control panel. If you choose to use a standalone pointing device, you can disable the driver from DOS. The IsoPoint uses standard Microsoft Mouse drivers.

The IsoPoint's mechanical rolling-bar-and-button system was invented by GRiD Systems' Craig Culver. Currently, if you want the IsoPoint, you are limited to one computer: the GRiDCase 1550SX, \$5,095 with a 60MB hard disk and internal modem. (You can also buy the computer with a CD-ROM drive as the 1550CD.) At 12.7 pounds and 2.5 by 11.5 by 15 inches (HWD), the GRiDCase is not on the cutting edge of packaging. But little of the unit's bulk (other than an inch of the depth) is related to the IsoPoint. Zenith Data Systems (708-808-4800) expects to ship its new SuperSport 486 and 486SX portable with the IsoPoint before year's end, but these machines will also be heavy: more than 14 pounds.

GRiD IsoPoint

GRiD Systems Corp., 47211 Lakeview Blvd., Fremont, CA 94537; 800-222-4743.

List Price: \$5,095 for the GRiDCase 1550SX laptop with the IsoPoint installed. **In Short:** A rotating, sliding, straw-shaped shaft built into a laptop in front of the Spacebar, the IsoPoint adds about an inch to the depth of a portable PC. Its desirability is much a factor of personal preference. Currently available in the 13-pound GRiDCase 1550SX, it is planned for inclusion later in the year in a pair of equally bulky Zenith portables.

CIRCLE 545 ON READER SERVICE CARD



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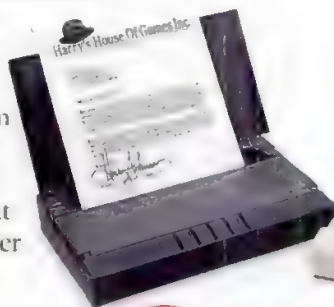
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CIRCLE 187 ON READER SERVICE CARD

COVER STORY

PORTABLE POINTING DEVICES

times as bulky as a Microsoft Mouse. The cord stretches 8 feet, twice as long as necessary. The optional steel foot pedal (\$10) that serves as an alternative left mouse button has another 8-foot cable and adds an extra pound of weight.

TopTrak's left and right buttons dominate the upper left and right corners. Sandwiched between them are a textured drag-lock button and a simultaneous left/right button. Driver installation is easy. You also get AMENU.COM, a series of mouse menus for programs such as *Lotus 1-2-3* and *WordPerfect*. The foot-pedal option includes LCS/Telegraphics' *Telepaint*, a low-end paint program.

TopTrak may be an adequate pointing device for the desktop, but it's too bulky to be seriously considered for portable computers. And the low-current claim isn't much of a distinction: Almost every popular pointing device works fine with a laptop.

TopTrak

Kraft Systems Inc., 450 W. California Ave., Vista, CA 92083; 619-724-7146.

List Price: \$89.95; \$99.95 with foot pedal and *Telepaint*. **In Short:** The TopTrak works with portable computers, but that doesn't make it a portable pointer. A trackball too bulky for portable use, with an optional foot pedal that duplicates the left mouse button, it's far too big for serious consideration.

CIRCLE 547 ON READER SERVICE CARD

LOGITECH INC.

TrackMan Portable

by Robert W. Kane

Logitech believes that the trackball is the tool of choice for portable pointing devices. The world's largest manufacturer of mice and the winner of an Editors' Choice award for its desktop trackball (*PC Magazine*, August 1990), Logitech brings considerable design expertise to the \$169 TrackMan Portable trackball. It's roughly similar in function to Microsoft's BallPoint Mouse, although there are enough subtle differences to make the two far from interchangeable.

The 2- by 2.8- by 3-inch dimensions (excluding the attaching clip) may make the TrackMan Portable easier to use than the BallPoint for those with large hands. Its three-button design carries over from other Logitech input devices (even though most software uses only one or two of the

buttons). With a single button on the side and the other two buttons on the top, your index finger is always positioned on the primary (left mouse) button. For left-handed users, the position of the primary button can be flipped 180 degrees to allow the unit to be mounted on the left side of the keyboard.



Logitech's TrackMan Portable, \$169, can attach to the side of a laptop or be used as a freestanding trackball.

Mounting the TrackMan on your laptop is both a blessing and a curse. It attaches with a sliding, spring-loaded U-channel clip that grabs the side of the portable's case, as long as the attaching point is no wider than 5/16 of an inch. The mounting angle is fixed at 45 degrees (the BallPoint's is variable). Annoyingly, you must attach the TrackMan in two pieces and remove the mounting clip in order to remove the ball. You can, however, close the lid of your laptop with the unit attached, unlike the BallPoint. The compromises are less bothersome if you use TrackMan as Logitech suggests: freestanding on the desk or held in your hand. With six nonskid feet on the bottom, the TrackMan Portable sits at a 5-degree angle and can be readily cradled in your hand.

The removable, cerulean 1-inch trackball spins on optomechanical wheels with a base hardware resolution of 200 ppi (the BallPoint's is 400 ppi). The cord is 26 inches long and has a DB-9 serial connector (but no round PS/2 adapter) and a 6-foot extension for desktop users. While the standard DOS driver has ballistic tracking capabilities, the *Windows* driver does not. This may be acceptable with a VGA screen, but 200 ppi on an 800-by-600 or 1,024-by-768 desktop display will wear your thumb out in no time at all.

The compromises inherent in both the

Microsoft and Logitech trackballs are dissatisfying. Of the two, Logitech appears to be the slightly better choice.

TrackMan Portable

Logitech Inc., 6505 Kaiser Dr., Fremont, CA 94555; 800-231-7717, 415-795-8500. **List Price:** With cable and 6-foot extension cable, \$169. **In Short:** This versatile, ergonomically designed handheld 200-ppi trackball can be clipped to the side of your laptop (at one fixed angle only) or used freestanding on your desk. Users with large hands may find the TrackMan Portable more comfortable than Microsoft's BallPoint Mouse. It has annoying procedures for attaching and detaching but, unlike the BallPoint, lets you close your laptop with the device attached. It was the second-most-expensive product we tested.

CIRCLE 548 ON READER SERVICE CARD

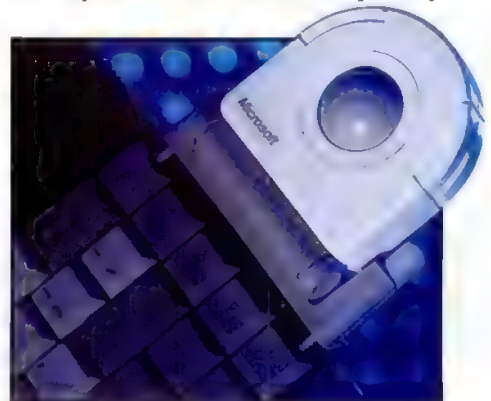
MICROSOFT CORP.

BallPoint Mouse

by John R. Quain

Like Logitech's TrackMan Portable, Microsoft's \$175 BallPoint Mouse is a small trackball-type device that clips to the side of your laptop or rests alongside on your desk. The simple D-shaped form attaches easily to most laptops.

Technically, the BallPoint Mouse is neither a mouse nor a trackball; it's a thumb-rolling device. You operate it with your forefinger resting on the curved click buttons and your thumb resting on the ball. There are four buttons: two along the top edge and two along the bottom edge. Either pair can be selected as the primary



Microsoft's BallPoint Mouse, \$175, is a portable trackball-shaped device. It attaches easily to most laptops but must be removed to close the laptop cover.

COVER STORY

PORTABLE POINTING DEVICES

and secondary (left and right) buttons.

The BallPoint attaches to a laptop (or a desktop PC keyboard) with a quick-release bracket and a pair of thumbscrew clamping arms. Microsoft provides three sizes of arms. The BallPoint juts out about 3.5 inches from the side of the laptop, has a coiled 4-foot cord with a DB-9 serial connector (plus a PS/2 adapter), and adds 6 ounces to your laptop.

Software installation is easy. The driver takes about 16K of memory. The driver, Version 8.0, works with both the BallPoint and the Microsoft Mouse. You cannot, however, use earlier versions of the Microsoft Mouse driver with the BallPoint.

How do the BallPoint and the TrackMan Portable compare? Either can attach to the side of a laptop or stand on its side on a desk. The BallPoint uses a slightly larger, textured 1.1-inch ball; you may find it feels more comfortable and gives you better control over the cursor. The TrackMan uses a lighter and smoother ball that tends to spin more freely. The BallPoint's hinged clamp is adjustable; the TrackMan attaches at a fixed angle.

The BallPoint uses a mechanical system of rollers resting next to the ball to drive the encoder disks and move the cursor directly (the TrackMan uses opto-mechanical technology). In testing, it did not appear quite as precise as the Microsoft Mouse, but the BallPoint's base resolution of 400 ppi is fine-grained enough for any of today's notebook screens. Additionally, the ballistic tracking (or sensitivity, as Microsoft calls it) can be set from 0.75 ppi to 22,400 ppi.

You cannot close your laptop with the BallPoint installed. It also will not fit on every portable (the IBM PS/2 L40 SX is difficult, for example). On some notebook PCs, the BallPoint blocks the floppy disk drive bay or the brightness and contrast controls. But Microsoft offers a "fit guarantee": If the BallPoint does not fit on your computer, you may return it within 30 days of purchase.

At press time, Microsoft planned to release an updated *Windows* mouse driver for the BallPoint (and the Microsoft Mouse) by late summer. It will increase the size of the arrowhead when the cursor is in motion, making the arrowhead easier to see on laptop displays. Owners can get the driver by calling Microsoft technical support or by downloading it from an online service such as Microsoft's forum on CompuServe. Microsoft has also planned

laptop-specific accessories to allow users to close their PCs without having to remove the clamp.

BallPoint Mouse

Microsoft Corp., 1 Microsoft Way, Redmond, WA 98052-6399; 206-882-8080. **List Price:** \$175. **In Short:** A small trackball that clips to the side of a laptop or keyboard or sits on the desk, the BallPoint Mouse is a good compromise for laptop owners who need a pointing device. The mounting clip has to be removed before you close the cover. It's a matter of personal preference whether Microsoft's or Logitech's implementation of the mini-trackball is more comfortable to use. Unlike the TrackMan Portable, the BallPoint can be adjusted to more than one angle. It was the most expensive product we tested.

CIRCLE 549 ON READER SERVICE CARD

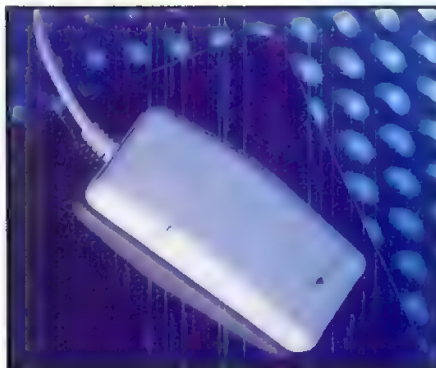
MOUSE SYSTEMS CORP.

The Little Mouse/PC

by John R. Quain

As a compact portable pointing device, Mouse Systems Corp.'s downsized \$134.95 Little Mouse/PC suffers from an enormous drawback: It's an *optical* mouse. That means you have to carry a special reflective mouse pad. Leave the pad on the plane or in your hotel room, and your mouse is a paperweight until you can get to a computer store and find a spare optical mouse pad.

If you can get past that drawback, you'll probably like The Little Mouse/PC. In



Mouse Systems Corp.'s Little Mouse/PC, \$134.95, is small but requires an optical pad, an inconvenience for laptop users.

side-by-side hands-on comparisons with all other portable pointing devices (and with the industry-standard Microsoft Mouse), we found that The Little Mouse/PC provided the most accurate cursor control of all. The optical technology (a single LED and a photo detector) is not affected by the occasional crumbs of dirt that can make a mechanical or opto-mechanical mouse skip a beat.

The two-button optical mouse has no internal moving parts and operates just like the standard mouse—no unfamiliar hand-crimping or arcane thumb-rolling techniques to master. But for laptop users, the issue is not The Little Mouse/PC's performance but portability. The pad is 7 by 8 inches and cannot be rolled up or folded in half. The mouse itself is 1.8 by 4 inches, noticeably smaller than the 2.2-by-4-inch Microsoft Mouse.

The Little Mouse/PC can be adjusted via ballistic tracking (300 ppi to 30,000 ppi) to use an area of only 3 by 5 inches. In addition to the automatic installation software, Mouse Systems Corp. supplies several pop-up mouse utilities for a variety of best-selling applications, including current versions of *Lotus 1-2-3*. Mouse Systems provides free driver upgrades for the first year, although there is no toll-free technical-support hotline at the moment. The Little Mouse/PC comes with a 6-foot cord (a bit long for portable users), a DB-9 serial connector, and a serial-to-PS/2 adapter.

The Little Mouse/PC

Mouse Systems Corp., 47505 Seabridge Dr., Fremont, CA 94538; 415-656-1117.

List Price: With reflective mouse pad, cord, and extension cord, \$134.95. **In**

Short: The Little Mouse/PC is a compact and highly accurate device. But it's an optical mouse, which means you have to carry (and try not to lose) a 7-by-8-inch reflective pad. For this reason, it is not really suited for portable computing.

CIRCLE 550 ON READER SERVICE CARD

SUNCOM TECHNOLOGIES

ICONtroller

by Oliver Rist

Suncom Technologies' \$99.95 ICONtroller represents the mini-joystick segment of the portable-pointing-device genre. Your taste may be for either a joystick or a mouse. With a joystick, the on-



IBM believes these computers But only until

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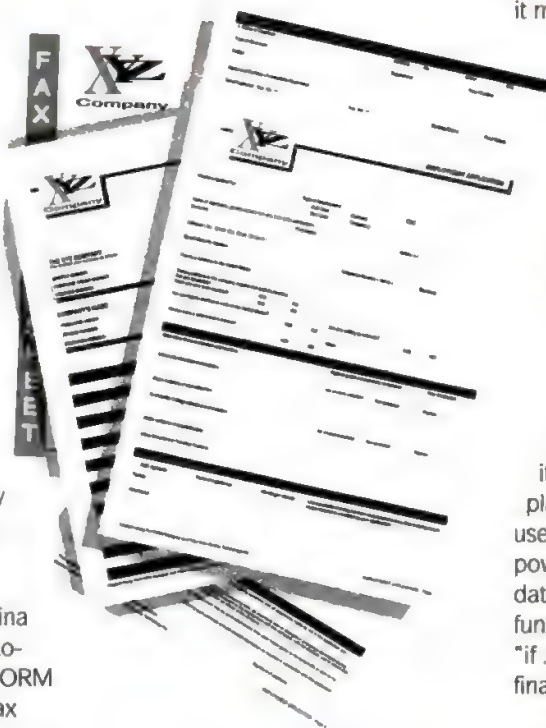
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Suncom Technologies' ICONtroller, \$99.95, is a miniature joystick that can be attached to the laptop with Velcro.

screen cursor continues to move as long as the stick is off-center; the cursor stops moving when you return the joystick to neutral. With a mouse or trackball, you need continuous motion to keep the on-screen cursor moving. For most laptop applications, you should find it easy to get used to the ICONtroller and its inch-long joystick.

The ICONtroller is small, 2 by 1.3 by 3 inches (including the controller stick), and bristles with buttons and switches. It has three buttons on the base (left, right, both), a user-selectable button on the joystick tip that usually duplicates the left mouse button, and switches that control cursor speed and driver type (either Microsoft or Suncom).

With a competitive price, easy software installation, fast learning curve, and well-thought-out design, the only drawback to this little joystick is its method of attachment. On some laptops, it may obstruct access to a disk drive or screen controls. The ICONtroller attaches to the side of your laptop with an industrial-strength Velcro-like hook-and-loop tape made by 3Com. If you do not attach the ICONtroller, you will need two hands to operate it. (An extremely dexterous user might find it possible to cup the joystick in one hand and manipulate it with a thumb or index finger.) Suncom says that it is developing an alternative mounting solution that should be ready by this year's Fall Comdex.

The ICONtroller comes with installation and testing software (in 5.25-inch and 3.5-inch formats) and a DB-9 serial connector. Installation is easy: Simply load the disk and follow either the electronic or printed instructions. You may run the driver either from the command line or from your CONFIG.SYS file.

ICONtroller

Suncom Technologies, 6400 W. Gross Point Rd., Niles, IL 60648; 708-647-4040. **List Price:** \$99.95. **In Short:** This miniature device has one mouse button at the tip of the 1-inch joystick. It must be attached to the side of your laptop or you'll need both hands to control it.

CIRCLE 601 ON READER SERVICE CARD

Eric Berlin is an editorial assistant of PC Magazine. Robin B. Bornstein is an assistant editor of PC Magazine. Bill Howard is an executive editor of PC Magazine. Robert W. Kane is benchmark manager of Ziff-Davis Labs and former technical director of PC Magazine Labs. John R. Quain is a New York-based free-lance writer and a frequent contributor to PC Magazine. Oliver Rist is a staff editor of PC Magazine.

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CIRCLE 354 ON READER SERVICE CARD



Downsizing to LAN-Based Accounting

by Mike Falkner

Is your business ready to say goodbye to expensive mini and mainframe accounting systems? These nine high-end, multiuser accounting packages are designed for optimal LAN performance.

Today's managers know that to stay competitive they have to build better products, process orders faster, and keep inventories leaner. The right accounting software can play an important role in achieving those goals.

In this evaluation, we test multimodule, multiuser accounting software designed to run on a LAN. We intended to review the 11 market leaders (as determined by cross-referenced market share data from Dataquest Digital Information Group and Price Waterhouse), all of which have extensive vertical application catalogs and large support networks in the field. We actually tested *AccPac Plus*, *CYMA Professional Accounting Series*, *Data Pro Accounting Series*, *Great Plains Accounting Series*, *The IBM Platinum Series*, *Libra*, *Macola Accounting Soft-*

ware, *RealWorld Accounting and Business Software*, and *Solomon III*. State of the Art declined to submit *M.A.S. 90* for testing, and Open Systems was preparing a major upgrade to its flagship product of the same name (including an entirely new interface) at the time of testing.

WHY DOWNSIZE?

Less than five years ago, true high-end accounting software required a heavy-

duty minicomputer, a big programming staff, and an entourage of support personnel to keep everything afloat. Lacking both the people and the pocketbook for that kind of maintenance, smaller companies turned to PCs for solutions. Vendors responded with products that over the years have matured into sophisticated LAN systems, often outperforming more-

expensive hardware setups (see "Can LANs Beat Minis?," May 29, 1990). Now, PC-based multiuser accounting software has found its way into multimillion dollar companies that are downsizing their accounting operations.

Downsizing from minis and mainframes to LANs lets you dump expensive maintenance contracts, reduce the size of the computer room, and choose among competitively priced PCs and servers from many manufacturers. In addition to the savings, PC accounting products almost always offer better user interfaces.

Once your company shakes the "we're unique" syndrome, you may find that a LAN-based accounting package can often handle your most taxing information and reporting requirements. In fact, the volume of records and transactions that need to be processed is more important than the actual size of the company. On PC Magazine Labs' performance tests, several packages easily processed over 6,000 general ledger accounts, 75,000 general ledger transactions, 2,000 vendors, 10,000 open payable items, 5,000 customers, 45,000 open invoices, and 20,000 inventory items.

THE STATE OF THE MARKET

For smaller businesses, a bevy of low-end accounting packages like the \$149 *DacEasy* and the \$199 *Peachtree Complete III* continue to flourish, adding modules and features similar to those of their high-end counterparts. Less than \$300 buys you General Ledger, Accounts Payable, Accounts Receivable, Inventory, Order Entry, Payroll, and other modules that support multiple companies. The \$49 *Pacioli 2000* even includes network support, and *DacEasy* and *Peachtree* offer separate network versions.

The demands of a multiuser accounting environment, however, quickly overwhelm these low-end packages. Many high-end accounting packages, such as *Great Plains Accounting Series*, *The IBM Platinum Series*, and *Macola Accounting Software* are fine-tuned for LANs, using tools like *NetWare 386's* *Btrieve* *NLM* to improve performance. Many are written to recover gracefully from system failures (*Solomon III* is a good example), and most have sophisticated record locking, or in the case of *RealWorld Accounting and Business Software*, field locking, which allows two users to update the same record. Low-end packages are usually found at retail software stores and supported via

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Additional support services were provided by Price Waterhouse representatives **Michael Grom, CPA**; **Elizabeth Rafter, CPA**; **Liz Chernak**; and **James Martone**.

telephone, while high-end systems are sold directly by dealers who can install and support the software at your site.

It's getting harder to find a midrange accounting package that offers a good compromise between features and price. Packages like Manzanita Software Systems' *BusinessWorks* (\$295 per module) and Great American Software's *One-Write Plus* (\$295 for three modules) offer a compelling combination of ease of use and power, but more and more buyers want their features at a low-end price.

TESTING ON THE LAN

PC Labs subjected all nine packages to tests more exhaustive and demanding than those performed in our last high-end accounting evaluation ("LAN Accounting Software: Up to Speed on the PC Platform," September 26, 1989). The testing teams, which included Price Waterhouse representatives and vendor representatives (who were invited to ensure that the software was configured optimally) used two LANs to test the products.

Since our last evaluation, some programs, most notably *Macola*, have made great improvements in performance. Although *CYMA* and *Libra* had trouble with the concurrent reporting test, most of the packages handled the tests of performance degradation under increasing workload without significant problems.

Competition has inspired a number of welcome changes in the packages. *Macola* has modernized its outdated menu system, for example, and it now incorporates Btrieve, which is becoming the record manager of choice, giving users more access to data with commercially available tools instead of with custom programs. Recovery from system failures is delivered in all but a few packages, and *Solomon III* takes recovery more seriously than most by resuming interrupted processes at the point where the failure occurred.

Not only are the packages improving, so are the third-party tools that enhance them. *Platinum* bought the financial report writer *FRx* to give its General Ledger module more reporting power than most of its competitors. *Great Plains*, *Platinum*, and *Macola* have embraced Channel Computing's *Forest & Trees*, which lets CFOs and others use its powerful executive information access tools to drill down into the accounting database.

None of the packages, however, have adequately addressed some of the key

requirements that large organizations need before they will consider downsizing. Larger account numbers, intercompany processing, and international accounting features are just a few examples. For a look at some more-expensive products that offer such features, see the sidebar "The First Steps to Downsizing."

HOW THEY COMPARE

Debits are debits no matter what package you use, but each package is oriented toward a slightly different audience. *Macola* recently expanded its suite of manufacturing modules, and it's one of only a handful of packages that can adequately support that environment. *Plati-*

num is one of the most flexible programs, while *Great Plains* and *Solomon III* have strong General Ledgers. *RealWorld* and *AccPac* are notable for the hundreds of vertical applications that have been designed for them. See the Suitability to Task ratings to find your perfect fit.

Since no one package can be a solution for everyone, many vendors encourage third-party developers to create industry-specific applications that tie to their packages. *Platinum* and *Macola* support *SaleMaker* and *Telemagic*, two sales-force automation systems for companies with a heavy sales orientation, and *RealWorld* Corp. sells its own sales-force automation system with its accounting software. Almost all the programs have developers' tools to help them integrate new modules



EDITORS' CHOICE

Macola Accounting Software

All nine of these multiuser accounting programs are able to meet the requirements of most businesses; they are extremely sophisticated tools. Since our last evaluation, all of the programs have been improved—some slightly, some notably—and it's clear that in this very competitive market, everyone is watching everyone else.

Macola Accounting Software earns not only an Editors' Choice but also a "Most Improved" award. Its redesigned user interface is much easier to use, and its 15-digit, three-segment account number is a nice high-end touch. *Macola* is a well-rounded solution and includes a full range of manufacturing modules (ideal for manufacturing businesses, though not an Editors' Choice criterion), and its Btrieve record manager helped make it the best performer in testing (*Great Plains* and *Platinum* have also incorporated Btrieve). While *Macola's* data entry screens could still use some sprucing up, it offers unsurpassed functionality.

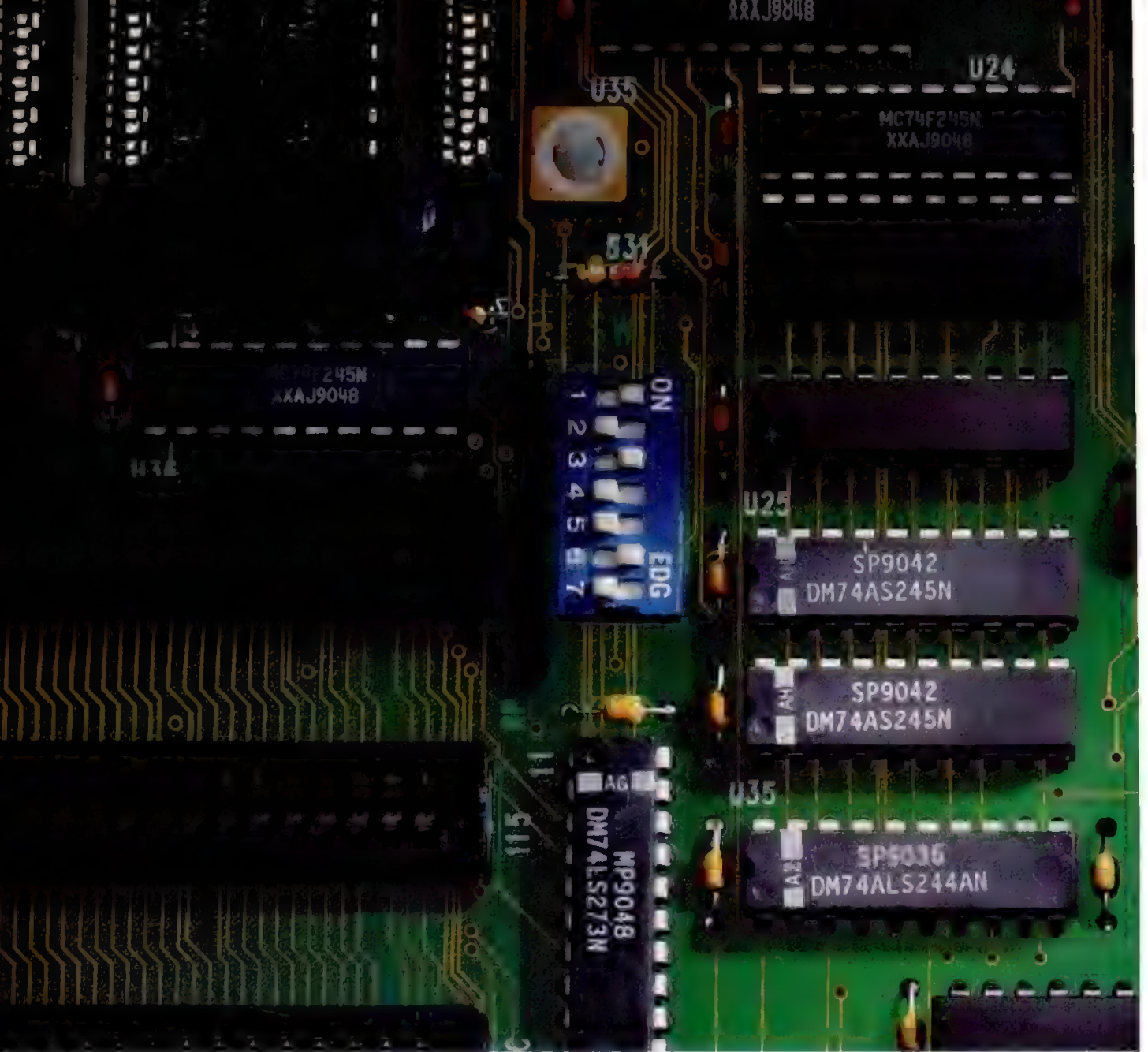
Great Plains and *IBM Platinum*, both previous Editors' Choices, earn honorable mention. *Great Plains* continues to lead its competitors with its excellent support organization, and Version 6.0 adds several new features, many of which improve its General Ledger. Nevertheless, it trails *Macola* in overall functionality. To

improve *Great Plains'* performance on large networks, *Great Plains* Software should rethink the product's file locking, which can unnecessarily restrict your access to important features while other users are on the network.

Honorable mention also goes to *The IBM Platinum Series*, which was second to *Macola* in overall network performance. A lack of significant improvements since our last review leaves this version lagging slightly behind *Macola*, but we await the next major release of this impressive program. *Platinum* is still the most flexible high-end accounting program you can buy, even in its current version.

Among the other programs, *RealWorld Accounting and Business Software* and *AccPac Plus* have the strongest collection of vertical applications available, so if your needs are very specialized, take a look at their third-party catalogs.

Solomon III, Version 7.0, has many feature enhancements, and though it may cost slightly more to implement (given its requirement for a dedicated database server on the LAN), it has the best fault-tolerance capabilities of the programs tested. It can even restore automatically from the middle of an aborted posting.



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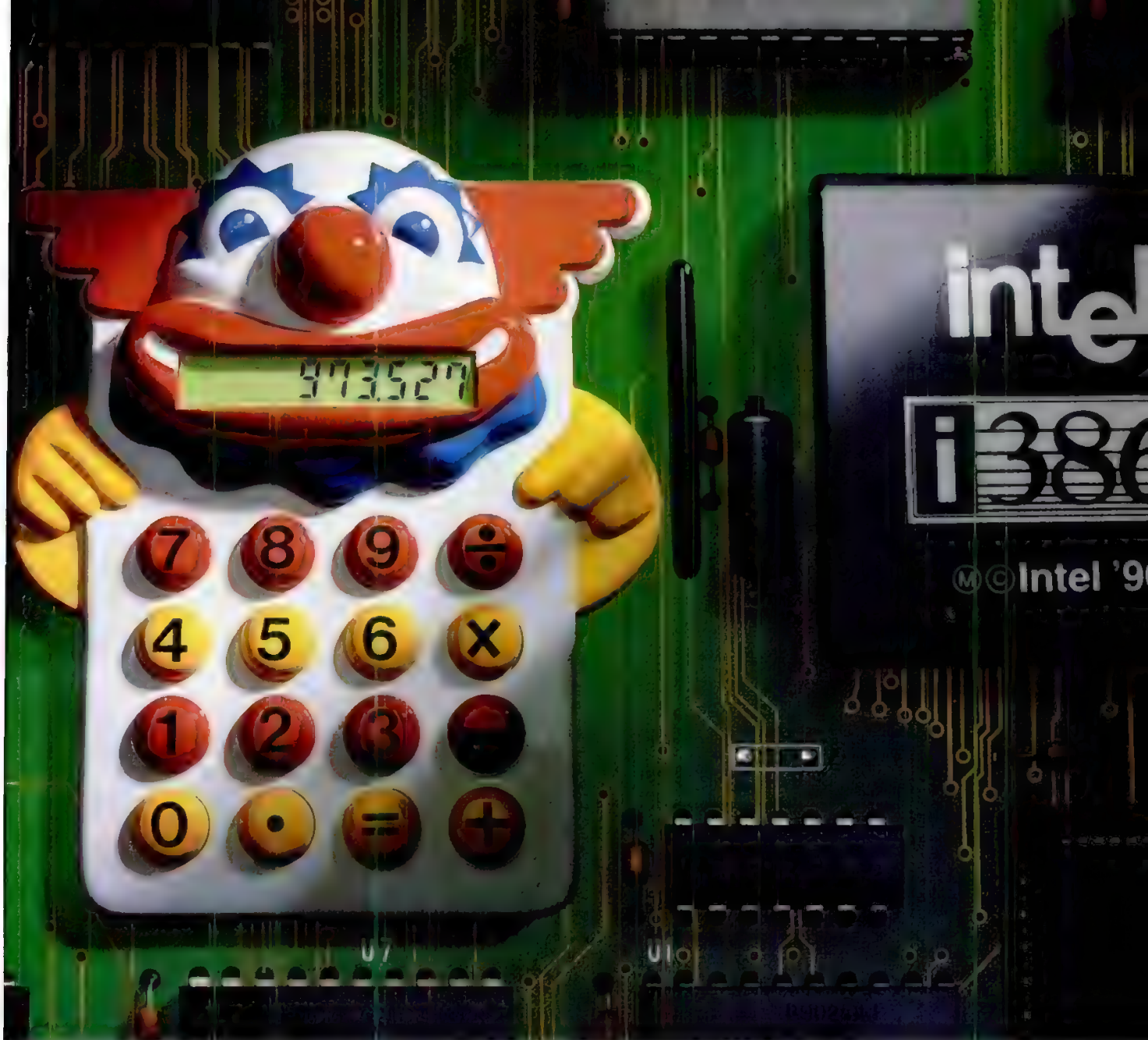


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into their software, and with Btrieve becoming a data management standard, third-party developers are having an easier time writing add-ons for accounting packages.

Often, these vertical-market solutions are the end of a frustrating search for just the right package. With only one or two packages to choose from, however, you should be sure the value of having the module outweighs any shortcomings in the accounting software that goes with it. High-end accounting vendors seldom support these packages, nor do they al-

ways require the interface to match their own. If you use a vertical application, and have two programs and two support lines, there is the potential for a lot of finger pointing.

SUPPORT ISSUES

As accounting software companies pour their resources into development, they rely more than ever on dealers and consultants for support of their growing line of modules. Dealers are the main point of

contact, installing your packages, creating report formats, designing account structures, and saving your data when something goes wrong. They master the software they sell and can tune it at your site, a service difficult for vendors to provide.

Once you decide to put all of your accounting eggs in one dealer's basket, however, you're betting that he'll be around when you have problems. To lessen the risk, you should get a list of dealers and consultants certified to install and support your software. All of the packages tested also have their own support departments, so you can buy support directly from them. A few even offer a guaranteed 1-hour response time.

LOOKING FORWARD TO WINDOWS

Microsoft Windows has made big strides since our last evaluation, and accounting developers are already exploring the Windows market. Peachtree Software, Computer Associates International, and Teleware have already released low-end Windows-based products, and Advanced Business Microsystems is working on some interesting OS/2 products. Several packages now have pull-down menus, and developers are working on Windows compatibility so that the packages can run in a DOS window.

Changing a package into a real Windows application, however, is a huge programming effort. There is also no guarantee that a market even exists for high-end Windows accounting software, though the new low-end packages (Teleware's *M.Y.O.B.* in particular) prove that a graphical interface can be a great place to do accounting.

LOOKING FORWARD TO SQL

SQL servers continue to proliferate, and accounting programs will need to offer SQL hooks or an SQL server-based solution to attract forward-looking companies (*Macola* will be among the first to do so). An SQL implementation requires a significant investment, yet, as accounting information becomes part of a larger corporate database, companies interested in downsizing will be attracted to packages that can be integrated with their other databases. *Forest & Trees* has already whet some corporate appetites for easily accessible information, and as packages like *ObjectVision* evolve, users will expect powerful, graphical tools to manipulate their accounting information.

LAN ACCOUNTING SOFTWARE: SUITABILITY TO TASK

Your choice of accounting software will depend on your organization's size, user base, and operating requirements. These ratings highlight strengths and weaknesses of each program to help you find the perfect fit.

Usability, while not a specific task, is critical to accounting software, since the program you choose will become the backbone of your business. We look at the quality of the user documentation, the look, feel, and intuitiveness of the user interface, the availability and thoroughness of on-line help, the availability and consistency of look-up windows, the quality of technical support and software maintenance, and the availability of national training and training aids, including videotapes and training manuals.

General accounting refers to how flexible and full-featured the package's General Ledger, Accounts Payable, Accounts Receivable, Inventory, and Order Entry modules are for straightforward general business accounting.

Auditing refers to the program's ability to find the source of financial transactions through the use of posting and other related reports, as well as the program's ability to recover from system anomalies such as aborted postings.

Programs strong in customization can be altered to meet your organization's needs. Are there vertical applications available to meet your specific industry requirements? Have other developers produced complementary products? Are the existing reports flexible enough to meet your requirements? Is source code available for minor modifications or significant rewrites? Is data accessible for use with other development tools?

Multuser accounting refers to how well the software operates on a LAN. This may be particularly important in big organizations with large transaction volumes, where speed is a primary concern. Also considered here is the level of file, record, and field locking available for trouble-free simultaneous access.

Note: The sum of the scores should not be used for product comparison and is not a factor in determining Editors' Choices.

SUITABILITY TO TASK

Product Name

	1	2	3	4	
Usability	✓				1—Poor
General accounting		✓			2—Fair
Auditing			✓		3—Good
Customization				✓	4—Excellent
Multuser accounting					N/A—Not applicable: The product does not perform this task.



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Jim Seymour

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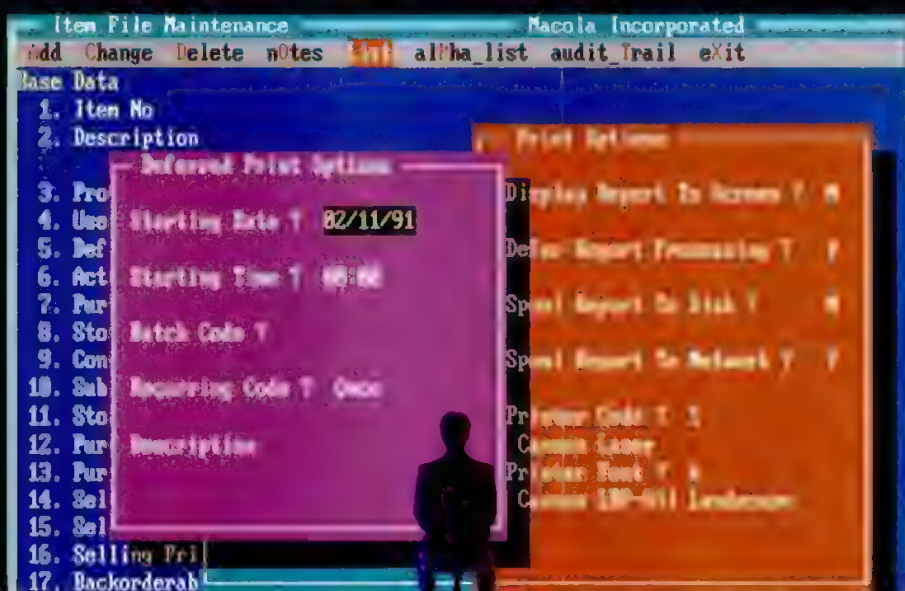
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A Streamlined, More Productive Operation. Macola has built new time-saving conveniences into Version 5.0, so each task is met with greater ease. Like full-screen editing and new macros to minimize keystrokes. On-line integrated graphics to communicate financial information at-a-glance. The use of arrow keys, optional hot keys and mouse control. All this, and more, to make your work less work.

The Basics Made Even Better. The same time-tested benefits that made Macola

a leader in business management systems are improved in Version 5.0. Like top LAN performance. Unparalleled depth of product with 17 integrated packages. The greatest number of customization options. And more add-on products to help you maximize the total integration of your company.

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WHAT ABOUT UNIX?

Another trend is the migration of LAN-based packages to the Unix environment. *Great Plains*, *RealWorld*, *Data Pro*, *Solomon*, and *CYMA* already have Unix-based solutions. Corporations are buying Unix hardware to replace more-expensive proprietary systems, while smaller companies are attracted to prices that fall below complete Novell network systems. Servers from MIPS, IBM, and others are remarkable performers for the price, and terminals cost just a few hundred dollars.

Unix performance is impressive, too. In informal testing conducted by Data Pro Accounting Software, a report that took 7 hours to complete with *Data Pro* on our DOS-based testing LAN took just 40 minutes on Data Pro's 486-based SCO Unix system.

THE BOTTOM LINE

Whether you investigate Unix solutions or DOS-based network solutions, the important thing is to investigate if your company's accounting is still mainframe or mini-based. Take a hard look at your hardware, software, and maintenance costs, compare them to those of a LAN solution, and see how the figures stack up. Then add in the improved interfaces and easier maintenance of network systems, and you'll begin to see that heavy-duty accounting on PCs makes good business sense.

AccPac Plus

by Dave Coulombe

The latest release of Computer Associates International's *AccPac Plus*, Version 6.0, offers solid accounting functionality, strong import/export capabilities, customizable forms, and the ability to interface with many third-party vertical-market products. Retail invoicing, payroll, job costing, sales analysis, and time and billing modules are available. Modules are priced at \$795 apiece.

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AccPac's G/L allows you to post to future or past months, but for greater

SUITABILITY TO TASK

AccPac Plus

	1	2	3	4
Usability			✓	
General accounting			✓	
Auditing			✓	
Customization			✓	
Multitask accounting			✓	

control, you can designate periods as open or closed for posting. Posting to a closed period, as with any type of posting error, will automatically create an error batch containing the transactions in question.

Although the report writer is powerful, novice users will need some time to become familiar with arcane formatting commands. Fortunately, *AccPac* provides various report formats that you can manipulate to meet your needs rather than starting from scratch.

ACCOUNTS PAYABLE

At the time of this review, Computer Associates had not released Version 6.0 of *AccPac's* A/P module, so we looked at Version 5.0C. *AccPac's* A/P handles basic payable functions, but it has some weaknesses that may concern high-end users. There is no purchase order system, and

A/P does not interface with inventory, so you have no detailed record of items purchased by the vendor. If you require P/O, you may want to consider a third-party P/O program from the many third-party products available for *AccPac*. You cannot enter invoices or write checks for one-time vendors; you must record them as if they were paid by a manual check. You can void a check through the check reconciliation process, but this will not reinstate the invoice.

On the positive side, A/P invoice entry handles retainages well and integrates to job cost and time and billing modules. Like all the other modules, the A/P module is built around batch data entry of transaction information, which enhances control and audit trail reporting. You can customize checks to your specifications and use the module's management and control reports to assist in managing your cash situation.

STREAMLINED RECEIVABLES

AccPac's A/R module is now able to define sales distribution tables and control account codes so that data entry is streamlined and less prone to errors. Instead of entering G/L account numbers and departments, you can assign six-character codes that represent G/L accounts.

A/R provides several helpful reports, including a tax-tracking report that lists by invoice tax information for each tax code. The customer statistics report includes invoice totals on a period-to-date, year-to-date, and prior-years basis; payment, discount, and volume totals; and customer performance statistics, such as average days to pay. As in A/P, you can design your own formats for key forms, including customer statements and mailing labels.

THE UNIVERSAL CORPORATION Oct 15 1991

Select (Transactions) for (1825) () Bank Account 2, Operating
for fiscal period (71, October 31, 1991)

TS-CC	Date	Reference	Description	Amount
7	GLJE Oct 03 91	816804	Full sale - ad & placements	2,500.00
7	GLJE Oct 03 91	816805	Agency commission & costs	5,528.15
7	GLJE Oct 15 91	816805	New pallets	750.00
7	GLJE Oct 15 91	816803	Trademark searches	1,230.00
Closing balance for period				1,040.55
Starting Date:		Batch Date:	Consolidated:	Edited:
12-5		24-2	(No)	(No)

Printed: 10:00 AM on 10/15/91

AccPac Plus's inquiry-by-transaction display in its General Ledger provides a quick look at the activity in an account, with posting information on each transaction provided at the bottom of the screen.

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Computer Shopper 2/91



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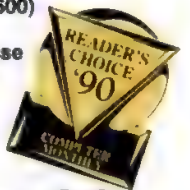
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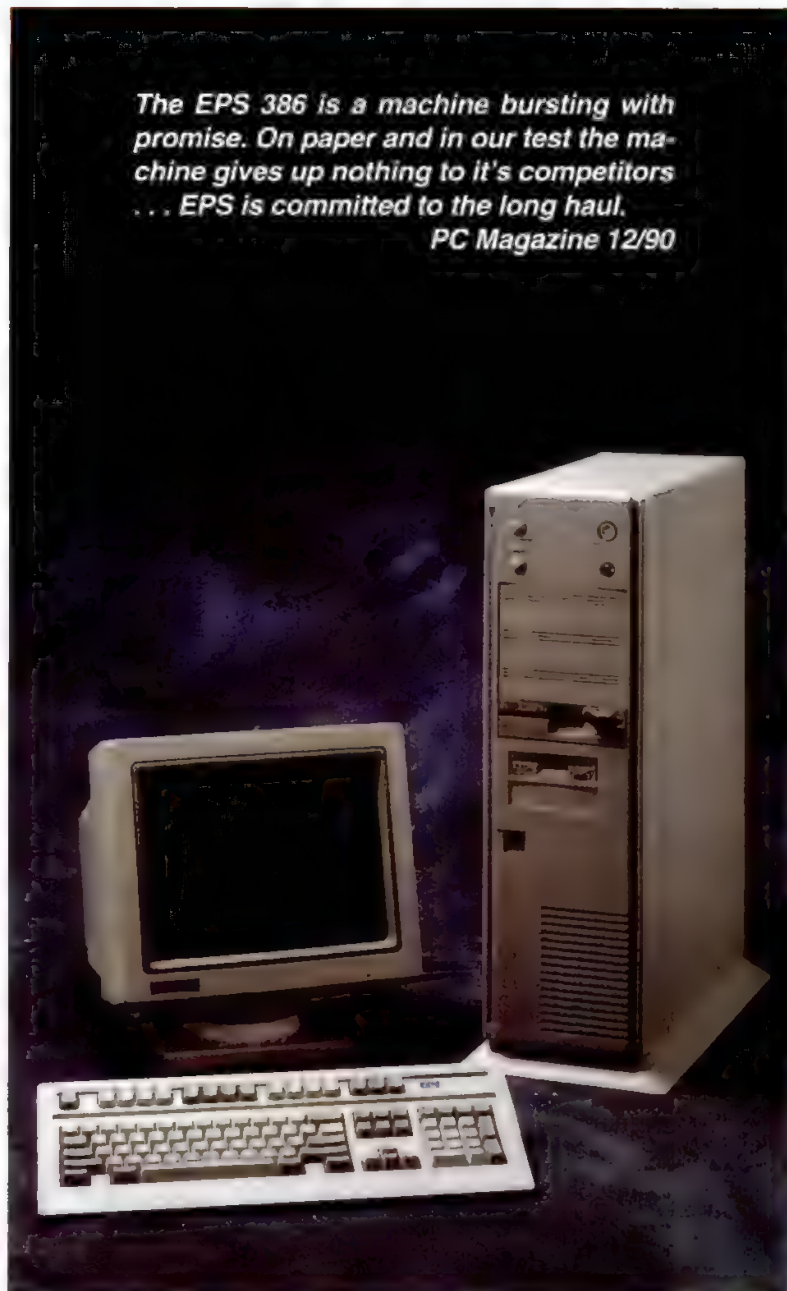
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PC Magazine 12/90

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Computer Monthly 2/91



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COMMISSIONS AND TAXES

The program's O/E module calculates commissions based on sales amount or margins but cannot split commissions. You can set up a table of miscellaneous charges to apply to an invoice. O/E prints order confirmations, packing slips, labels, and invoices, all of which you can customize.

O/E does a good job of tracking taxes. You can set up five tax jurisdictions (state, city, and so on) for each tax table and define tax rates by item and customer. Given *AccPac*'s Canadian heritage, it's not surprising that it calculates the Canadian Gross Sales Tax. The manual even devotes ten pages to an explanation of how to calculate it.

O/E reporting is good and includes many management reports that track orders and sales profitability. Additional sales reporting is provided in the Sales Analysis module, priced at \$495.

INVENTORY COSTING

Item numbers in Inventory can have a maximum of 16 characters, and a maximum of four segments of any length. *AccPac* supports five costing methods, including LIFO (last in, first out), FIFO (first in, first out), standard cost, weighted moving average, and a user-specified method. It also tracks unit of measure for stocking, pricing, and costing purposes. You can define up to four alternative stocking units of measure per item. Primary and secondary vendors, along with their part numbers, are captured for each item.



FACT FILE

AccPac Plus, Version 6.0
Computer Associates International Inc., 1240 McKay Dr., San Jose, CA 95131; 800-531-5236, 408-432-1727.
List Price: \$795 per module; four-unit LanPak, \$395; windowing system manager, \$195; graphics reporting option, \$149.
Requires: 512K RAM, (640K RAM with windowing system manager), DOS 3.1 or later.
In Short: *AccPac Plus* offers an appealing combination of solid accounting functionality, customizable forms, strong import and export capabilities, and a wealth of vertical products. Its lack of certain high-end features may be a drawback for some users.



CIRCLE 420 ON READER SERVICE CARD

A single-level bill of materials is provided for nonmanufacturing entities that perform minor assembly or repackaging functions. Purchasing transactions are entered through inventory, as are all movement transactions such as receiving and transfers.

There are a number of reports to assist you in managing inventory, including reports for reorder, slow-moving items, overstock, and valuation. Unfortunately, the program does not provide ABC analysis or reporting. *AccPac* does offer password security, but it's limited by the inability to assign passwords by user.

Computer Associates also plans to release *Dynaview*, an *F9*-like spreadsheet add-on that can dynamically read data from seven *AccPac* modules into the *SuperCalc* spreadsheet.

AccPac's performance times were respectable, with the program consistently finishing in the top half. Results ranged from a second-place finish for check preparation and posting to a sixth-place finish for order entry. *AccPac* had the best overall times among non-Btrieve-based products.

ACCOUNTING YOUR WAY

Computer Associates has a maintenance program that includes telephone support, upgrades, and a newsletter subscription for an annual fee. In addition to *AccPac Plus*, Computer Associates offers *AccPac Bedford* accounting for small companies and *AccPac BPI* for small- to medium-size companies. Data is transferable between programs.

Computer Associates publishes a directory called *CA Access*, which lists a wealth of add-in software solutions and third-party products that work in conjunction with *AccPac*. Some of the vertical niches addressed include auto dealerships, courier and messenger services, manufacturing, medical and dental, property management, and restaurants. If these don't meet your needs, you can develop custom modules using the *CA Access* library, which provides a full development environment including a compiler, editor, and screen forms manager. Or you can contract with one of the third-party software developers listed in *CA Access*.

While *AccPac*'s limitations may keep it from reaching the top of its class, it continues to be a good solution for many businesses.

CYMA Professional Accounting Series

by Barbara J. Mullins

CYMA Professional Accounting Series, Version 2.5, from CYMA Systems, is a flexible accounting system that can be adapted without source code modifications to meet unique requirements. In LAN performance and availability of high-end features, though, the program suffers. The basic series has six accounting modules:

SUITABILITY TO TASK				
CYMA Professional Accounting Series				
	1	2	3	4
Usability				
General accounting				
Auditing				
Customization				
Multiuser accounting				

G/L, A/P, A/R, Payroll, Inventory and Order Processing, and Job Control, ranging in price from \$695 to \$995 per module. *CYMA* is available for LAN, Xenix, and Unix platforms.

There are a number of useful tools to help tailor the system to your needs. You can attach free-form notes to records—customer, vendor, item, or G/L account—that will appear any time the record is accessed. Additionally, you can create user-defined fields for each record so that you may capture more customer or vendor information.

THREE REPORT WRITERS

The G/L allows for a 12-digit account number, six for the primary account and six for the subaccount. *CYMA* provides account masking throughout the entire system so you can easily select a range of accounts for reporting. Adding departments is an easy job with the copy accounts feature.

CYMA has two report writers, Report Generator and Relational Report Writer, available at no additional charge, and *CYMA* Report Writer for \$345. The first two are not intuitive, yet once you get the hang of it, you can produce some fairly sophisticated reports. The report format consists of programming-like commands, such as if/then and looping, and you can

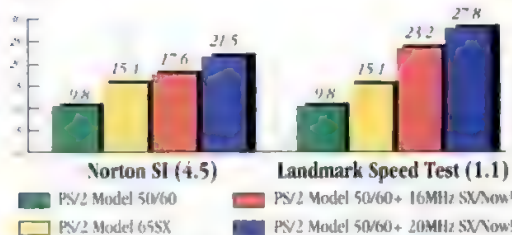
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CIRCLE 106 ON READER SERVICE CARD

even compile your format when you're finished.

BASIC ACCOUNTS PAYABLE

CYMA's A/P system performs the basics. It provides several useful reports, including an aging report with four user-defined

aging periods and ages on invoice or due date, as well as a penalty report that prints finance charges due on the date of the report. A/P supports both cash- and accrual-basis accounting. You can create

your own forms using the Format Program, but like the report generators, the formatting program is not intuitive.

Invoice entry is cumbersome. The invoice screen has no header, so you must enter vendor number and terms for each line item to be distributed. CYMA makes

dBASE: A Key to Customizable Accounting

by Raymond A. August

In this evaluation of high-end accounting software, our tests focus on speed and functionality, but it's worth looking at another class of accounting software that emphasizes user customization above all else: *dBASE*-based programs.

dBASE accounting products, typically based on *dBASE*, *Clipper*, or *FoxPro*, are popular because the *dBASE* language is so widely known and used. There are dozens of tools available to manipulate .DBF files, including report writers, screen painters, and code generators. For example, if you want your accounting system to integrate with *Lotus 1-2-3*, look no further than *Lotus's DataLens* for *dBASE* files.

Some say that *dBASE* just doesn't cut it in the accounting world because of its limited functionality and relatively poor network performance (which is why we chose not to run performance tests on these products). *dBASE* diehards will quickly argue that extensive functionality is worthless if it doesn't fit a business's particular requirements. If you need to add a feature to a *dBASE*-based product, just go ahead and program it in—something you can't do with many of the high-end products reviewed here.

THE SBT SOLUTION

SBT Corp. claims to have the largest installed base of any accounting software in its class (over 120,000). SBT now markets two complete libraries that offer an upward migration path.

Modules in the *Database Accounting Library* list for \$595 per module and offer basic accounting functionality (see "LAN Accounting Software: Up to Speed on the PC," September 26, 1989). *Professional Series* (\$1,295 per module), written in *FoxPro*, expands on its predecessor's features and

programmability. To automate your operations further, SBT also markets *Database Executive Library*, which includes contact management and fax communications modules.

SBT has DOS, LAN, Xenix/Unix, DEC, and Macintosh versions. The company prides itself on its extensive certified consultant base, vertical-market application support, and an ongoing commitment to cater to the *dBASE* community. With its multi-tiered product offerings, SBT has positioned itself to accommodate all levels of user sophistication. (SBT Corp., 800-227-7193, 415-331-9900).

Champion Business Systems is celebrating the tenth anniversary of *Champion Accounting Software*, which lists for \$595 per module. *Champion* offers a full, nine-module DOS and Macintosh-based library; a Unix version should be released this fall.

This accrual-based library offers 100 percent real-time processing throughout all modules. O/E, point of sale, and purchase order are all embedded within the A/P and A/R modules.

Champion stresses the success of its technical support program, which guarantees a 30-minute response time and is available 24 hours a day. (Champion Business Systems, 800-243-2626, 303-792-3606.)

SOURCEMATE SELLS SOURCE CODE

First released in 1985, *SourceMate* Information Systems' updated *AccountMate*, Version II, core library includes seven modules priced at \$595 each. The package is a real-time, accrual-based system, and *SourceMate* emphasizes its simplistic front-end user interface, clean and consistent source code, and user flexibility during system setup.

SourceMate promotes the benefits of companies owning their own source

code, contending that companies should have the right to total control over their system through source code ownership. (SourceMate Information Systems, 800-877-8896, 415-381-1011.)

Lake Avenue Software offers the 13-module *Assistant Controller* library, which includes inventory with bill of materials and financial reporting and sells for \$695 per module. The program is available on DOS, Macintosh, and Unix platforms.

Unlike its competitors, Lake Avenue offers in-house programming services for large-scale projects. Lake Avenue targets medium-size companies who want a total solution to their software needs through customization. (Lake Avenue Software, 818-351-5483.)

Diamond Data Management's *Carat 050* library (G/L, A/R, A/P, invoicing, cash management, and reports) is sold as one module for \$1,495 for an eight-user version. It will run in any DOS or NetBIOS environment.

Diamond Carat, which is *FoxPro*-based software, lists for \$3,995. In both versions, the source code is not available, making it a total departure from its competitors. However, "hooks" are built into the software allowing developers to interface with customized programs.

Diamond Carat emphasizes "enterprise accounting," a business-oriented solution that requires little or no accounting knowledge to operate. To that end, there is no reference to debits or credits, postings, or month-end closings. *Diamond Carat* has extensive on-line help throughout each function. Its English-language approach to accounting will be a breath of fresh air for those with limited accounting skills. (Diamond Data Management, 800-955-3330, 414-786-9000.) ■

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CYMA's main menu shares the screen with a current-month calendar. Items such as payroll-tax deposit-due dates can be defined in the calendar, and you will be reminded when you enter the program on that date.

it easier by defaulting to the prior entry, but you still must cursor through each of these fields.

A/R COUPONS

A convenient feature in the A/R module gives users the option to print either a standard or user-defined Coupon Book. The Coupon Book is a series of payment slips to be submitted by the customer with his regular installment payment. Each slip includes customer name, due date, interest amount, balance due, payment amount, and new balance after current payment is made.

Cash receipts are entered through the Record Invoice Entries menu option. Instead of entering invoice line items, you select a product code designated as Payment. *CYMA's* A/R doesn't calculate commissions, but you can enter a salesperson ID for each invoice/order. The A/R module prints customer statements based upon customer, terms, or salesperson.

ORDERS AND INVENTORY IN ONE

CYMA packages O/E, purchase order, and inventory functions all in one module. O/E allows for sales of both stocked and nonstocked items, tracks the earliest and latest ship dates, and assigns tax by line item.

Heavy distributors may be concerned with certain weaknesses in O/E. You cannot create quotes or place an order or customer on hold. The program doesn't display an alternate item for out-of-stock items and doesn't notify you if a customer exceeds the credit limit. Furthermore, if the ship-to address is different from the billing address, you must either type the ship-to address when entering the order or set up a "new" customer in A/R and place the ship-to address in the bill-to field.

CYMA lets you specify up to 30 characters for inventory part numbers, maintain up to 26 price levels per item, and calculate prices from actual or standard cost or list price. However, you cannot associate the prices with customers for matrix pricing.

Options for inventory costing include FIFO, LIFO, Average, Standard, and Specific. To track serialized items, *CYMA* recommends you use specific (or actual) costing. This means that all items in inventory will be costed as such, causing potential problems for companies with mixed inventories. To assist in inventory management, *CYMA* provides Reorder and Overstock reports as well as an Inventory Performance report providing information on sales, cost of sales, profit margin, and percent of margin on each item.

CYMA provides two levels of password security. With *PAS Powerpak* (\$395), you can restrict users from spe-

cific companies and specific modules. This option also lets you set passwords at the menu level, but unfortunately not by individual user. Thus, working with *CYMA's* menu structure, the same person who enters sales orders can also create purchase orders.

PERFORMANCE TRADE-OFF

CYMA data files are stored in ASCII text format, which could be an auditor's nightmare considering the ease with which critical files could be altered. On the other hand, downloading and uploading data are simplified. *CYMA's* poor showing on performance testing can in part be attributed to ASCII data files; it finished near the bottom of the pack for nearly all of the performance tests. This poor showing can and should be a cause for concern for those with large, high-volume networks. However, *CYMA* displayed one positive trait: Very little performance degradation was encountered on both the one-workstation versus ten-workstation Order Entry tests and the reporting degradation tests.

An annual support contract with *CYMA* costs \$250 and includes free phone support and program updates. If you'd rather pay as you go, there's also telephone support for \$2 per minute (\$20 minimum). *CYMA's* user-defined fields and master file notes offer businesses ample flexibility, but you may be disappointed when you look beyond this and take a closer look at the program's overall functionality and performance.

Data Pro Accounting Series

by Thomas White and Lou Unkeless

FACT FILE

CYMA Professional Accounting Series, Version 2.5
CYMA Systems Inc.,
1400 East Southern Ave.,
Tempe, AZ 85282: 800-292-2962, 602-831-2607
List Price: \$695 to \$995 per module.
Requires: 640K RAM, DOS 3.0 or later
In Short: *CYMA* has some useful tools that promote flexibility, such as user-defined fields and notes, but poor LAN performance and the lack of some important high-end features limit this product.

CIRCLE 421 ON READER SERVICE CARD

Data Pro Accounting Series, Version 1.5, from Data Pro Accounting Software, performs basic accounting tasks well but falls short in some areas important to high-end accounting users. With each module priced at \$750 and no additional charge for network users, *Data Pro* is one of the least expensive packages evaluated here. Manufacturing, time billing, client write-up, point of sale, and other vertical-market applications priced from \$750 to \$1,850 per module are also available.

PRODUCTIVITY TOOLS

Data Pro's start-up tools include an on-line tutorial, periodic processing check-

Important information for YOU!

ZEOS just announced an unbelievably great deal!
For a limited time only, buy any new ZEOS Windows
system and you'll also receive Lotus 1-2-3 for
Windows PLUS Lotus' new Windows word processor Ami
Pro 2.0--AT NO EXTRA CHARGE! The best software
AND the best hardware! CALL ZEOS NOW: 800-423-5891

THE FIRST STEPS TO DOWNSIZING

by Raymond A. August

Regardless of their performance, LAN-based accounting solutions simply may not be robust enough for your business, especially if you require long account numbers. The largest account number in any product reviewed here is only 16 digits, a far cry from the 60-digit account numbers allowed by some mini- and mainframe systems.

In addition, you may want a client/server solution to take advantage of your current mini or mainframe as a back-end processor. You may want a package that has a graphical interface, an SQL database, or a supply of product-specific CASE tools to help you modify the software to fit your needs. Fortunately, beyond the high-end products we've tested here, an entire market of super high-end solutions does exist.

THE SOLOMON SOLUTION

Solomon Software's *Impacct* incorporates many of the design features that have made the company's other accounting packages, *Solomon III* and *ProfitWise*, so popular. These features include well laid-out data entry screens, excellent controls, and strong reporting. These similarities should facilitate the transition for *Solomon III* users who want to upgrade.

The current *Impacct*, Version 1.2, like *Solomon III*, has a 12-digit account number. *Impacct*, Version 2.0 (which Solomon says will be available by the end of the year), will have an impressive 48-digit account number with 16 user-defined segments.

Modules are currently available for G/L, A/P, A/R, Payroll, report designing, and system managing; *Impacct* is priced from \$10,000 to \$115,000 depending on the number of users and modules purchased. (800-879-2767, 419-424-0422.)

System Union's *SunSystems Accounting Software* is a popular choice in the multinational accounting arena. *SunSystems* provides comprehensive multicurrency accounting in all modules and the equivalent of a 35-digit

G/L account number. It also has excellent consolidation capabilities, including the ability to consolidate different databases and different Charts of Accounts.

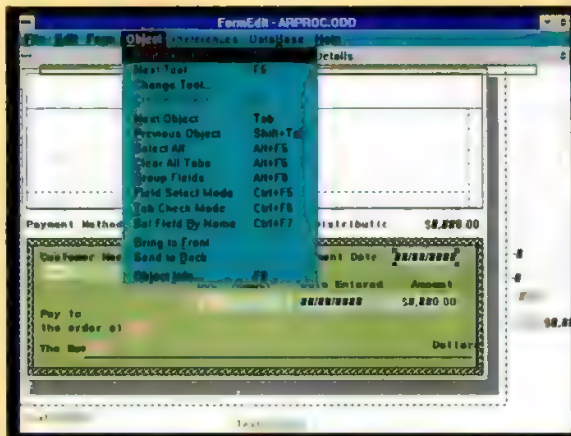
SunSystems is available in nine languages and runs on DEC-, UNIX-, and DOS-based networks and IBM AS400s. Data is fully compatible among all versions. *SunSystems* is one of the first programs with an SQL Server client/server engine. Pricing varies between \$3,500 and \$100,000 depending on modules purchased and

user-definable 35-digit, 10-segment account number, extensive budgeting capabilities, multicurrency capabilities, DDE support and strong allocation features, *SQL/Financials* can challenge the functionality of most mainframe products, while offering the intuitive characteristics of a well-designed *Microsoft Windows* application. *SQL/Financials* should have G/L, A/R, A/P, and billing modules in limited release by the end of the year. Pricing has not yet been determined. (800-227-7193, 415-331-9900.)

A product jointly developed by IBM and Advanced Business Microsystems and scheduled for release in 1992 may prove to be a real mainframe killer. This unnamed OS/2-based client/server system will be another addition to the growing *Platinum* family of products. Initially utilizing a Presentation Manager interface, future versions will be available for other graphical environments. The package will offer a 32-digit, four-segment account number and strong A/P, A/R, O/E, and Inventory modules. Not limited by its hard-coded feature set, the program will come standard with customization tools, including some that allow full

modification of all screens by the user. Pricing has not been determined. (800-IBM-7699.)

The *Intellisoft Accounting Series (IAS)* from Intellisoft is an innovative new product designed by one of the original developers of the *Data Pro Accounting Series*. A full library consisting of G/L, A/P, A/R, Inventory, Payroll, Point of Sale, Sales Order, and Purchase Order modules should ship this fall. *IAS* is a OS/2-based system that utilizes a Btrieve or Novell SQL record manager. Using a Presentation Manager interface, with a *Windows* interface expected later, *IAS* will include tools that allow for screen customization by the user, user-defined menus, and user modification of every report. Pricing has not been determined. (817-467-7243.)



This unnamed product, the newest member of the *Platinum* family, should be both feature-rich and flexible. With the form customization tool, users will be able to modify existing data entry screens or create new ones.

the platform. (914-948-7770.)

Even Dun and Bradstreet, developers and marketers of the two mainframe accounting champs *McCormack and Dodge* and *MSA*, are getting into the PC software business. Acknowledging that people want a PC on their desk and the power of a mainframe to process their data, Dun and Bradstreet is forging ahead with a whole line of client/server-based products. While noncommittal on whose client/server engine they will use, the company has disclosed that its R&D investment in this area is equivalent to its investment in their host-based products.

ON THE HORIZON

SBT Corp.'s *SQL/Financials* is one of the first products based on Gupta Technology's client/server engine. With a



“I can do what?”

Ami Pro 2.0 Brings Visual Word Processing to Windows.



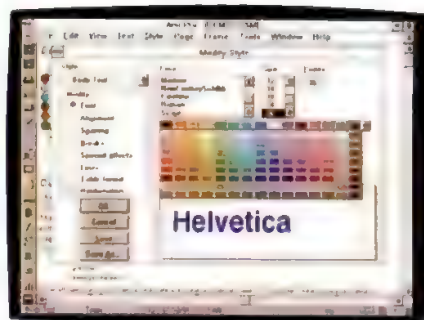
What separates Ami Pro™ 2.0 for Windows™ from every other word processor in the world? The ability to create documents the way you think, with words, pictures, graphs, symbols, drawings and colors.

We call it Visual Word Processing, and it's the fastest, easiest and most direct way to get what's on your mind on paper.

With Visual Word Processing,

complicated keystroke commands are a thing of the past. You work directly

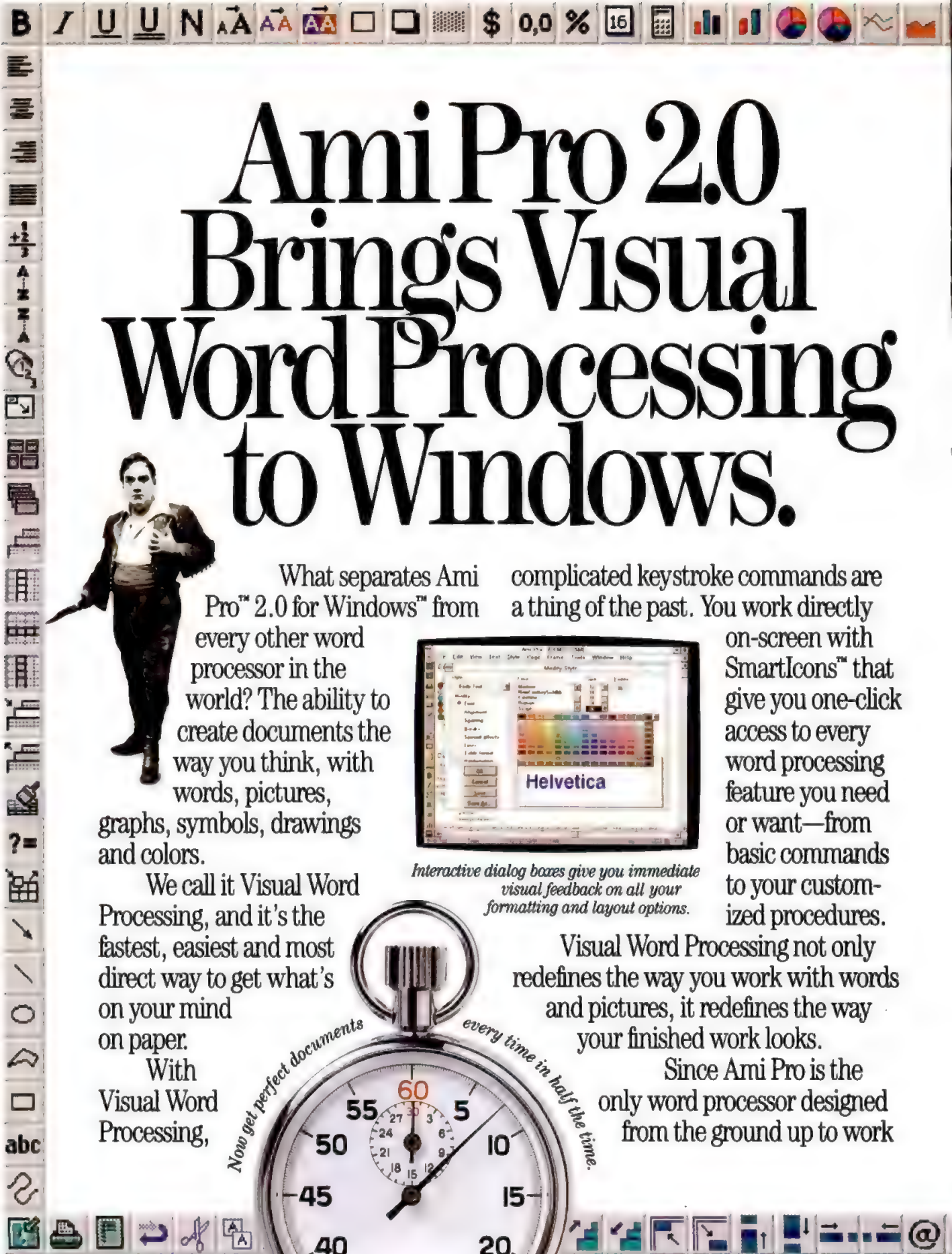
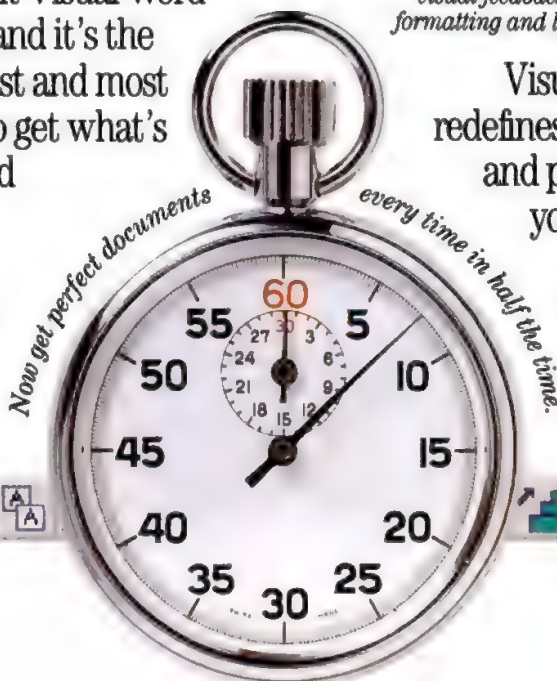
on-screen with SmartIcons™ that give you one-click access to every word processing feature you need or want—from basic commands to your customized procedures.



Interactive dialog boxes give you immediate visual feedback on all your formatting and layout options.

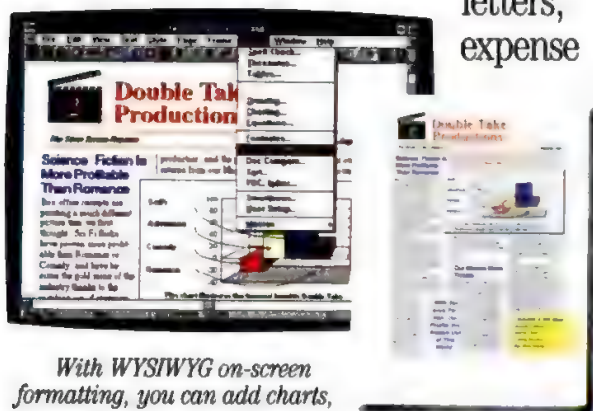
Visual Word Processing not only redefines the way you work with words and pictures, it redefines the way your finished work looks.

Since Ami Pro is the only word processor designed from the ground up to work



exclusively with the Windows environment, you can now take full advantage of all the rich graphic capabilities of Windows. You get true WYSIWYG that lets you edit in any view, and print out at anytime, whether you're zoomed in or zoomed out on the page.

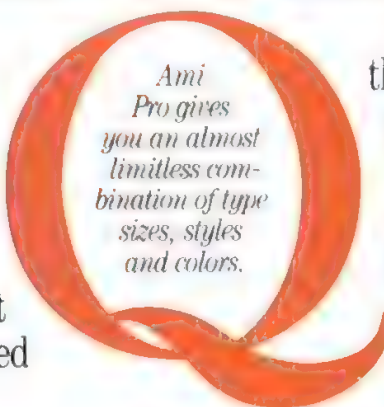
Ami Pro even comes with two dozen pre-formatted Style Sheets so you can get professionally designed letters, expense



With WYSIWYG on-screen formatting, you can add charts, scanned images, even free-hand drawings, then wrap text around any graphic you want.

reports, memos, reports and presentations as fast as it takes you to type in your text.

Visual Word Processing with Ami Pro 2.0 even redefines power word processing. Such features as spell check,



Ami Pro gives you an almost limitless combination of type sizes, styles and colors.

thesaurus, a full macro language, two way DDE support, merge, tables, variable view levels and integrated drawing and charting are all part of the package. And of

course, Ami Pro 2.0 reads and writes all other word processing file formats.

Naturally, Ami Pro 2.0 is integrated with the entire suite of Lotus® Windows applications. In fact, you have the ability to launch into two of the world's leading business applications: 1-2-3® and cc:Mail™, right from Ami Pro.

But see Ami Pro 2.0 for yourself. If you're currently a word processing user and would like to upgrade to Ami Pro 2.0 for only \$129, or for a free working model, call 1-800-TRADEUP, ext. 6026.

"Beg or borrow time on a system running Ami Pro, and you'll soon see what a word processor should be... It's the Best Buy for Windows users."
—PC World (6/91)



No other word processor can bring your words to life on paper like Ami Pro 2.0 for Windows.

Introducing Ami Pro 2.0 for Windows



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PRICE WATERHOUSE REPORT

LAN ACCOUNTING SOFTWARE

LAN ACCOUNTING SOFTWARE: SUMMARY OF FEATURES

Products listed in alphabetical order

	AccPac Plus	CYMA Professional Accounting Series	Data Pro Accounting Series	Great Plains Accounting Series	The IBM Platinum Series	Libra
Module Prices						
General Ledger (G/L)	\$795	\$795	\$750	\$795	\$795	\$795
Accounts Receivable (A/R)	\$795	\$695	\$750	\$795	\$795	\$795
Accounts Payable (A/P)	\$795	\$695	\$750	\$795	\$795	\$795
Order Entry (O/E)	\$795	\$995	\$750	\$795	Unavailable	\$1,295
Inventory	\$795	Included in O/E	\$750	\$795	\$795	\$795
Payroll	\$795	\$695	\$750	\$795	\$795	\$795
Canadian Payroll	\$1,200 (CDN)	Unavailable	Unavailable	\$795	Unavailable	\$300
Purchasing	Unavailable	Unavailable	\$750	\$795	\$795	\$200
Job Costing	Unavailable	\$995	\$950	\$995	\$995	\$1,295
Network system manager	\$195	\$895	Not required	\$1,295	\$1,095	\$1,500
Single-user system manager	Included in network manager	\$195	\$100	\$295	\$95	\$195
LAN System Features						
Maximum number of concurrent users	Unlimited	98	288	Unlimited	Unlimited	Unlimited
Displays list of users currently logged in	■	■	□	□	□	□
File and record locking:						
Automatic record locking	■	■	■	■	■	■
Automatic retry of locked records after delay	■	■	■	■	■	■
File lock allows read-only access	■	□	■	□	■	■
Locks message lists	■	□	□	□	■	□
Record lock allows reading by other users	■	□	■	■	■	■
Security:						
System password	■	■	■	■	■	■
Reporting privileges defined by password	□	■	■	■	■	■
File encryption	■	□	□	■	■	■
Time-conditional privileges	□	□	□	□	□	■
Audit trail of user activity	□	□	□	□	□	□
Audit of successful and unsuccessful access	□	□	□	□	□	□
SUPPORTED OPERATING SYSTEMS						
PC LAN	■	■	■	■	■	□
NetWare	■	■	■	■	■	■
VINES	■	■	■	■	■	□
Unix/Xenix	□	■	■	■	□	□
Lan Manager	■	□	■	□	■	□
APPLICATION SYSTEM MANAGER						
User-definable menus	■	■	■	■	■	■
Supports point-of-sale terminals	■	■	■	■	■	□
Allows deferred processing of batch transactions	■	■	■	■	□	■
Macro facility	■	■	■	■	■	□
Context-sensitive help screens	■	■	■	■	■	□
User-definable help screens	□	■	□	□	■	□
On-screen calculator	□	■	■	□	■	□
Data dictionaries	■	■	■	■	■	■
IMPORTS/EXPORTS						
.DBF files	■/■	□/□	■/■	■/■	■/■	□/□
Delimited ASCII files	■/■	■/■	■/■	■/■	■/■	■/■
.DIF files	■/■	□/□	■/■	■/■	■/■	■/■

PRICE WATERHOUSE REPORT

LAN ACCOUNTING SOFTWARE

LAN ACCOUNTING SOFTWARE: SUMMARY OF FEATURES

Products listed in alphabetical order

	AccPac Plus	CYMA Professional Accounting Series	Data Pro Accounting Series	Great Plains Accounting Series	The IBM Platinum Series	Libra
IMPORTS/EXPORTS (continued)						
SYLK files	■ ■	■/■	■/■	■/■	■/■	■/■
WK* files	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
MODULE INTEGRATION						
G/L with Fixed Assets	■	■	■	■	■	■
A/P with Job Costing	■	■	■	■	■	■
A/P with Bank Reconciliation	■	■	■	■	■	■
A/R with Job Costing	■	■	■	■	■	■
A/R with Order Entry	■	■	■	■	■	■
O/E with Inventory	■	■	■	■	■	■
O/E with Purchasing	■	■	■	■	■	■
Purchasing with Job Costing	■	■	■	■	■	■
PROGRAM MODIFICATION						
Source code available	■	■	■	■	■	■
Manufacturer makes code modifications	■	■	■	■	■	■
Third-party modifications available	■	■	■	■	■	■
Developers' guide available	■	■	■	■	■	■
GENERAL LEDGER						
Account number format (number of characters)	6-6	6-6	10	12	8	8
User-definable account structure	■	■	■	■	■	■
Maximum number of fiscal periods	26	Unlimited	13	13	13	26
Transaction dollar limit	\$9 billion	\$99 billion	\$999 billion	\$999 million	\$100 trillion	\$999 million
Maximum number of budgets per account	1	13	13	Unlimited	2	6
G/L FUNCTIONS						
On-screen account analysis	■	■	■	■	■	■
Processing suspension for unbalanced amounts	■	■	■	■	■	■
Automatic reversing entries	■	■	■	■	■	■
Automatic recurring entries	■	■	■	■	■	■
Automatic generation of account ranges based on department	■	■	■	■	■	■
Allows consolidations of different companies	■	■	■	■	■	■
Compresses ledger detail by account number	■	■	■	■	N/A	■
Compresses ledger detail by period	■	■	■	■	N/A	■
Allows entrance of next year's budget based on prior year's actual budget	■	■	■	■	■	■
Performs standard monthly allocations	■	■	■	■	■	■
G/L REPORTS						
Cash-flow statements	■	■	■	■	■	■
Cash-flow worksheets	■	■	■	■	■	■
User-definable financial ratios	■	■	■	■	■	■
User-definable column size	■	■	■	■	■	■
Allows creation of descriptive headings	■	■	■	■	■	■
ACCOUNTS PAYABLE						
Vendor number length (alphanumeric)	6	6	10	7	5	8
Maximum number of G/L distribution accounts	65,000	Unlimited	10	Unlimited	Unlimited	Unlimited
Maximum number of bank accounts supported	5	26	10	Unlimited	Unlimited	98
Maximum number of addresses per vendor	1	1	2	2	1,296	1

■—Editors' Choice

■—Yes

□—No

N/A—Not applicable: The product does not have this feature

PRICE WATERHOUSE REPORT LAN ACCOUNTING SOFTWARE

Macola Accounting Software	RealWorld Accounting and Business Software	Solomon III
□/■ ■/■	■/■ ■/■	■/■ ■/■
■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■
■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
8-8-8 ■ 13 \$999 million 99	8-8 ■ 13 \$999 billion 1	6-6 ■ 13 \$999 million 3
■ ■ ■ ■ ■	■ ■ ■ ■ ■	■ ■ ■ ■ ■
■ ■ ■ ■ ■	■ ■ ■ ■ ■	■ ■ ■ ■ ■
6 99 Unlimited 2	6 Unlimited Unlimited Unlimited	6 Unlimited Unlimited 1

CONTINUES

cally create purchase orders. You can provide clients a quotation with the proposal order and convert it to a live order when they accept it.

In this module, you can change price level, discount, taxability, sales, and cost of sales accounts by line item, as well as print picking tickets by bin number or part number, shipping labels, and bills of lading. You cannot add customers and inventory on the fly during order entry.

INVENTORY COSTING AND REPORTING

All types of transactions affecting inventory, including sales orders, purchase orders, and receipts, are handled by *Data Pro's* Inventory module. These transactions will update quantities and post financial data to the G/L. You can cost inventory at average cost, last cost, standard cost, LIFO, or FIFO, but the limit of 20 cost layers per item may be a problem for some businesses.

Part numbers used for defining all attributes of an item can be up to 20 characters long and have up to four segments. Multiple warehouses, multiple bins, colors, sizes, lengths, anything unique to the item must be included in the part number structure.

Data Pro's flexible Inventory reporting provides an Inventory Turns report by month and year to date. A Stock Requirements Aging report tells you what items are required to fill open sales orders and spreads them over four user-defined periods to show you what you need to buy or make to meet demand.

On the Mixed Processing tests, *Data Pro* finished in the middle of the pack. Slowed down by an over-5-hour Detail General Ledger Report test result, *Data Pro* was disqualified from having its composite score tabulated.

CUSTOMIZATION AND SUPPORT

Data Pro also offers *Stage 1*, a low-end single-user package priced at \$295 per module, and for companies requiring greater performance from their accounting software, *Infinity*, which has the same functionality as *Data Pro Accounting Series* but runs on non-Intel-based computers. User interfaces and data files are compatible through each product line.

Program source code is not available, but *Data Pro* will modify software for customers on a fee basis. By the time you read this, *Data Pro* will have released a C-



FACT FILE

Data Pro Accounting Series, Version 1.5
Data Pro Accounting Software Inc., 5439
Beaumont Center Blvd.,
#1050, Tampa, FL 33634;
800-237-6377, 813-885-
9459.

List Price: \$750 per module; System Administrator, \$100 for unlimited users.
Requires: 640K RAM, DOS 3.1 or later.
In Short: *Data Pro* is a multiplatform accounting system that covers the basics well. It may not be the best fit if you're looking for a package primarily with high-end features.

CIRCLE 422 ON READER SERVICE CARD

language interface that gives third-party developers read access to *Data Pro* data files.

Data Pro comes with 30 days of free telephone support and then charges a rate of \$15 per 10-minute phone call. Charges for new releases are \$100 per module.

Data Pro is a relatively inexpensive accounting system that covers the basics well. Its helpful productivity tools, variety of vertical market offerings, and ability to run on a number of Unix platforms can make the package appealing to many businesses, even if it doesn't match some of the other packages reviewed here feature for feature.

Great Plains Accounting Series

by Lee A. Hills

Great Plains Software's *Great Plains Accounting Series*, Version 6.0, is a major upgrade to this previous Editors' Choice package. Significant features have been added to an already capable base, and most modules are priced at \$795.

The new task window lets you modify menus, add, change, or remove existing menu choices, call external programs, or, in conjunction with *Great Plains'* macro facility, initiate macros from a menu selection. Lookup windows exist for most fields but are missing in some screens. You can add vendors and customers during transaction entry, but settings in the user's security profile will be ignored. To make matters worse, there is no report that lists records added on the fly.

Transaction entry is batch-oriented, except in O/E, and Account Distribution

Now you can upgrade without upgrading

An Indianapolis report is something you'll never have to create again.

Align tables or text across a range of columns—left, right, or center—with one simple command.

You can wrap text around graphs automatically.

Add framed drawings or symbols to call attention to critical data.

A feature that only 1-2-3 offers to DOS spreadsheet users is the ability to embed as many "box" graphs on a worksheet as you'd like.

Improved, 3D-effect graphs are added and more impact to your report.

Mix bold, italics, underlines, colors, and typefaces to create over 100 text style combinations—more than any other spreadsheet.

Thanks to AutoComp, you can easily make an entire report fit on one page.

WeCycle Waste Corporation The Materials Research Group Recommendation: FOCUS: ALUMINUM

... Research Group provides the
... continue to

This study
basis for
expand:
next 6
proport
during



WeCycle Waste Corporation

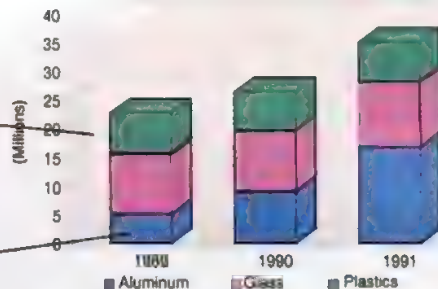
The Materials Research Group Recommendation:

FOCUS Aluminum

This study conducted by the Materials Research Group provides the basis for our most recent recommendation that WeCycle continue to expand its aluminum recycling capacity by another 70% over the next 6 years. The graph to the right shows the increasing proportion of our business provided by the aluminum division during the past three years, now approximately half of all revenues. It is our opinion that, at this rate of growth, aluminum recycling will continue to offer our company its greatest opportunity for expansion over the next decade, and certainly into the 21st century.



Gross Revenues by Product



Glass and Plastics

As can be inferred from the graph to the left, glass and plastics recycling has been holding steady throughout this same period, and has consequently become a smaller proportion of our overall sources of revenue.

Although this group would strongly recommend that WeCycle Waste Corporation do all that is necessary to increase its activities in these areas, our studies have shown that aluminum will become increasingly the material of choice in the shipping, heavy manufacturing and container industries.

Aluminum

It is our opinion that sources of aluminum products will be pressed close to their limits over the next decade.

Therefore, we propose that WeCycle Waste Corporation invest in more aluminum capacity during the next five years in order to take the best advantage of this increasing market demand.

WECYCLE PRODUCT	1989	1990	1991
Aluminum			
East	2,323,426	4,019,527	7,315,539
Central	1,372,347	2,374,160	4,320,972
West	1,726,492	2,966,831	5,436,033
Total	5,422,265	9,380,518	17,072,544
Glass			
East	2,496,721	2,567,821	2,798,925
Central	3,598,757	3,217,693	3,507,285
West	4,217,635	4,471,294	4,873,710
Total	10,313,113	10,256,808	11,179,920
Plastics			
East	2,897,493	3,171,243	3,234,668
Central	1,873,938	1,823,697	1,860,171
West	2,378,942	1,967,421	2,006,769
Total	7,150,373	6,962,361	7,101,608

de your spreadsheet ng your hardware.

There's a lot to like about the new Lotus® 1-2-3® for DOS Release 2.3.

For starters, it's not just a graphical spreadsheet. It's a fast, graphical spreadsheet for DOS. It's easy to use. And it works as well on an older XT with just 512K of memory as it does on the newest 486 machine.

It also shares many features in common with our powerful 3D spreadsheet 1-2-3, Release 3.1. Including its superb spreadsheet formatting and publishing capabilities and full mouse support. Along with its popular Auto Compress feature that gives you a trouble-free way of making larger worksheets print on a single page.

We've also added new features you won't find in other spreadsheets. Like



With its WYSIWYG graphical environment, you can do all your formatting "live" on screen.

the Viewer (based on Lotus Magellan® technology) which lets you view files before retrieving them and makes file linking as easy as point and click. And a very helpful Auditor that simplifies the job of documenting and analyzing worksheet logic.

Of course, you won't just like what Release 2.3 does. You'll like how it feels. It's quick and smooth. With a WYSIWYG (what-you-see-is-what-you-get) graphical environment that lets you format text, data, and graphics "live" on screen. With the mouse, you can execute commands, highlight cells or ranges, open dialog boxes, place and size graphs, change type styles, fonts and point sizes. All with unparalleled speed and ease.

What's more, Release 2.3 gives you a wide range of printing and reporting capabilities. Including the capacity to place as many live graphs on a worksheet as you'd like.

Along with 96 type style combinations, drop shadows, new 3D-effect graphs, drawing and annotation tools, and the most font support, choices of colors and shading available.

Compatibility? As with any 1-2-3 product, it's no problem. Because Release 2.3 will read all of the files you've created on previous versions of 1-2-3, including files you've formatted using Allways™ and Impress™. So you'll preserve all your work, as well as your training.

For more information see your Lotus Authorized Reseller. For a free demo or to order your upgrade directly from Lotus® call 1-800-TRADE-UP, ext. 6171.



Lotus 1-2-3 Release 2.3 runs smoothly and quickly no matter what hardware you're running it on.



What's New In Lotus 1-2-3 Release 2.3.

- A WYSIWYG graphical environment with live on-screen formatting
- Lotus Magellan viewer technology for fast file previewing, retrieving and linking...all without leaving your active worksheet.
- More graph types, including 3D-effect graphs and graph annotation capabilities.
- Auto Compress, for a trouble-free way of making larger worksheets print on single page
- Dialog Boxes for an easier, more interactive way of working
- Text-editing for easy on-sheet word processing, including automatic word wrap, even around graphs
- The Auditor for documenting or highlighting your spreadsheet logic
- Improved memory management for building larger worksheets up to 12 MB in size
- New printer drivers that support all leading laser and dot-matrix printers
- Context-sensitive, interactive Help and an on-line tutorial

*Please have your credit card and product package ready when you call. In Canada, call 1-800-668-1509.

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The new Lotus 1-2-3 for DOS



PRICE WATERHOUSE REPORT
LAN ACCOUNTING SOFTWARE

LAN ACCOUNTING SOFTWARE: SUMMARY OF FEATURES

Products listed in alphabetical order.

	AccPac Plus	CYMA Professional Accounting Series	Data Pro Accounting Series	Great Plains Accounting Series	The IBM Platinum Series	Libra
ACCOUNTS PAYABLE (continued)						
Maintains and recalls data fields on formatted screen for:						
Form 1099 flag	■	■	■	■	■	■
Vendor "pay-to" address	■	■	■	■	■	■
Alternative order-from address	□	■	■	■	□	□
Last check number	■	□	□	■	■	□
Last check amount	■	□	□	■	■	□
Last check date	■	■	□	■	■	□
Last purchase date	■	■	□	■	■	□
Purchases made this year to date	■	■	■	■	■	■
Purchases made last year to date	■	■	■	■	■	■
A/P FUNCTIONS						
Uses system-generated voucher numbers	□	□	□	■	■	■
Detects duplicate invoice numbers for the same vendor	■	■	■	■	■	■
Performs quick add of vendors during data entry	■	■	■	■	■	■
Allows one-time vendors	■	□	■	■	■	■
Customizes checks	■	■	□	■	□	■
Allows date-triggered recurring vouchers	□	□	■	■	■	■
voids the check and invoice simultaneously	□	□	■	□	■	■
Reinstates the invoice as unpaid	■	■	■	■	■	■
Allows proper posting of intercompany vouchers	□	□	□	□	□	■
Indicates payment "hold" status by invoice number	■	■	■	□	■	■
Prints remittance advices on plain paper	■	□	■	■	■	■
Reconciles checks against bank statement	■	□	■	■	■	□
A/P REPORTS						
Cash-basis financial reports	□	■	■	□	■	■
Cash requirement reports	■	■	■	■	■	■
IRS Form 1099	■	■	■	■	■	■
Cash projection by discount dates	■	■	□	■	■	■
Cash discounts lost	■	■	□	■	■	■
ACCOUNTS RECEIVABLE						
Maximum number of customers	65,000	999,999	100,000	Unlimited	Unlimited	Unlimited
Customer number length (alphanumeric)	8	6	10	7	5	8
Maximum number of open transactions	4 billion	999,999	1 million	Unlimited	Unlimited	Unlimited
Maintains average days-to-pay (past 12 months)	■	□	■	■	■	□
Maintains date and amount of last sale	■	□	■	■	■	□
Allows multiple A/R ledger accounts	■	□	■	■	■	■
Allows multiple ship-to locations per customer	■	□	■	■	■	■
Processes cash receipts for multiple cash accounts	■	■	■	■	■	■
Allows date-triggered recurring transactions	■	□	■	■	■	■
Tracks cash received against recurring transactions	■	□	□	□	■	□

PC—Editors' Choice

■—Yes

□—No

PRICE WATERHOUSE REPORT
LAN ACCOUNTING SOFTWARE

LAN ACCOUNTING SOFTWARE: SUMMARY OF FEATURES

Products listed in alphabetical order

	AccPac Plus	CYMA Professional Accounting Series	Data Pro Accounting Series	Great Plains Accounting Series	The IBM Platinum Series	Libra
ACCOUNTS RECEIVABLE (continued)						
Writes off small differences between receipts and invoices	☐	☐	☐	☐	☐	☐
Prints detailed deposit slips for cash received	☐	☐	☐	☐	☐	☐
Calculates commissions based on gross profit	☐	☐	☐	☐	☐	☐
Calculates commissions based on payments received	☐	☐	☐	☐	☐	☐
Displays credit-line data during invoice entry	☐	☐	☐	☐	☐	☐
A/R REPORTS						
Statements for open item and balance-forward customers	☐	☐	☐	☐	☐	☐
Sales analysis by customer category	☐	☐	☐	☐	☐	☐
Finance charge report	☐	☐	☐	☐	☐	☐
Cash forecast by due date	☐	☐	☐	☐	☐	☐
Cash forecast by average pay date	☐	☐	☐	☐	☐	☐
Cash discounts taken	☐	☐	☐	☐	☐	☐
Cash discounts not taken	☐	☐	☐	☐	☐	☐
User-definable statements	☐	☐	☐	☐	☐	☐
User-definable invoices	☐	☐	☐	☐	☐	☐
Dunning letters	☐	☐	☐	☐	☐	☐
ORDER ENTRY						
Maximum number of line items per order	9,999	273	200	32,767	Unlimited	Unlimited
Maintains and recalls data fields on formatted screen for:						
Credit hold check	☐	☐	☐	☐	☐	☐
Shipping method	☐	☐	☐	☐	☐	☐
Commissions paid	☐	☐	☐	☐	☐	☐
UPS zone code	☐	☐	☐	☐	☐	☐
Average number of days-to-pay by customer	☐	☐	☐	☐	☐	☐
Year-to-date payments	☐	☐	☐	☐	☐	☐
O/E FUNCTIONS						
Converts quotation into firm order	☐	☐	☐	☐	☐	☐
Adds inventory items during order entry	☐	☐	☐	☐	☐	☐
On-line lookup of alternate items on hand during order entry	☐	☐	☐	☐	☐	☐
Blanket order processing	☐	☐	☐	☐	☐	☐
Allows ordering of non-stock items	☐	☐	☐	☐	☐	☐
Tracks serial numbers of items sold	☐	☐	☐	☐	☐	☐
Calculates multilevel taxation	☐	☐	☐	☐	☐	☐
Generates UPS-approved mailing labels	☐	☐	☐	☐	☐	☐
Splits commissions among salespeople	☐	☐	☐	☐	☐	☐
Handles drop shipments	☐	☐	☐	☐	☐	☐
O/E REPORTS						
Back-order reports	☐	☐	☐	☐	☐	☐
Cancelled orders	☐	☐	☐	☐	☐	☐
Sales commissions due	☐	☐	☐	☐	☐	☐
Past-due orders	☐	☐	☐	☐	☐	☐
Warranty reporting	☐	☐	☐	☐	☐	☐
Bill of lading	☐	☐	☐	☐	☐	☐

 — Editors' Choice

☒ — Yes

☐ — No

PRICE WATERHOUSE REPORT LAN ACCOUNTING SOFTWARE



FACT FILE

Great Plains Accounting Series, Version 6.0

Great Plains Software
Inc., 1701 SW 38th St.,
Fargo, ND 58103; 800-
456-0025, 701-281-0550.

List Price: \$795 per
module; system manager
with Executive Advisor,
\$1,025 for unlimited users.

Requires: 640K RAM, DOS 3.1 or later.
In Short: A comprehensive, well-designed
accounting system, *Great Plains*, Version 6.0,
includes an improved General Ledger module.
The program is supplemented by strong
documentation and customer support direct
from the company.



CIRCLE 423 ON READER SERVICE CARD

weak point. *Great Plains* tracks commis-
sions only by inventory item, not by cus-
tomer. There are several calculation meth-
ods for each inventory item based on cost,
price, or profit. Without the Payroll mod-
ule, you can track salespeople's numbers
but not names.

CHECKING CUSTOMER CREDIT

Great Plains allows entry of orders, re-
turns, and quotes, but unfortunately there
is no facility for blanket orders. Non-
inventoried items can be entered and in-
voiced through the O/E module.

The credit-checking facility verifies
every line item during order entry to make
sure the credit limit is not exceeded. If a
customer happens to exceed his credit
limit, a separate credit limit password can
override the imposed limit. You can track
orders by serial number but not by lot
number.

Great Plains cannot print pick lists,
Open Order reports, shipping, or UPS la-
bels by location, and you can ship only
from one warehouse on an individual
order. Point-of-sale processing provides a
bonus: a basic POS solution that can be
integrated with a bar-code scanner and a
cash drawer.

TRACKING INVENTORY

The Inventory module provides good
functionality for most businesses and al-
lows LIFO and FIFO (on either a periodic
or perpetual basis), weighted moving av-
erage, or standard cost. G/L accounts are
associated with each inventory item, and
two substitute items can be associated
with an item.

You can attach unlimited vendors to
each item and track key information such
as last order quantity, last order date, last
receipt date, and expected lead time. Each
inventory ID has six user-defined, table-
driven, eight-character fields so you can
report on information unique to your
organization.

You can establish unlimited price
breaks, each with up to five price levels
for each item. The finished goods compo-
nent assembly (or kit) capability is full-
featured and allows tracking of serial num-
bers and backflushing. The Purchase
Advice report can automatically create
purchase requisitions.

CHECKING AND REPORTING

If you need to handle multiple checking
accounts, take deposits on orders, print
deposit slips, or perform back reconcili-
ations, you will find the Cash Manage-
ment module (\$695) a necessity. With
this module, you can also reconcile mul-
tiple bank accounts, perform fast account
balance inquiries, and create deposit
slips.

The Report Maker Plus, a derivative of
Novell's Xtrieve, produces custom re-
ports and extracts data from the data
files. The import manager imports numer-
ous data types into *Great Plains*.

Now included with the System Man-
ager, the Executive Advisor is a unique
reporting and graphing tool. Once you
map your accounts, the system provides
171 unique views to help manage your
business. Modules are also available for
Property Management and Printers.

Reports can be sent simultaneously to
screen, printer, and file. Keystroke mac-
ros are very easy to create and run. You
can define your own format for most
forms, including checks, invoices, and
purchase orders.

PERFORMANCE

Great Plains displayed good results on
our tests, finishing third overall. In a
large multiuser environment, *Great
Plains* can hinder productivity due to the
locking of data files, which requires users
to avoid performing certain tasks or to log
off the system. For example, while print-
ing A/R statements, you cannot print most
other significant A/R reports. Or while
performing A/P check processing, you
cannot enter purchase orders. Password
maintenance and printer maintenance
require that all other users be completely
logged out of the software.

CONTINUES

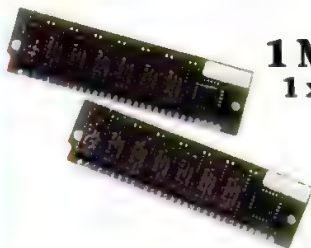
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more room in which to work. If

you have one or a thousand computers to upgrade, MS-DOS 5 is the best choice for convenience, security and reliability.

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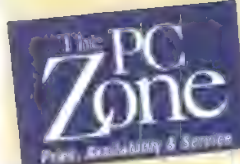


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Recently given *PC World's* Best Buy Award, this high-end program lets you design, fill in and maintain customized business forms. Includes the ability to build simple to complex calculations, database lookups, data entry validation tables and electronic security.

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\$285



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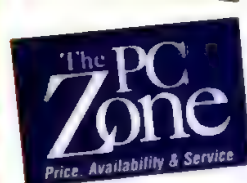
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\$49

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Adobe Type Manager



Adobe Type Manager 1.1

Get crisp, clean-looking text automatically, at any point size and in virtually any Windows 3.0 program with Type Manager including ATM software. You also get near-laser-quality output with the HP LaserJet, DeskJet, dot matrix or other non-PostScript printer.

\$58

Type Align

Type Align for Windows is a powerful desktop publishing and graphics tool for manipulating text. Stretch text to fit curves, spirals, circles, freehand drawing figures—indispensable for any design or graphics person. Must be used with Type Manager.

\$58



Berkeley Systems After Dark for Windows

\$28

When your computer is on but unattended, images burn into your screen, causing permanent damage. After Dark prevents burn-in by automatically displaying animated

screen art. It has over 35 different displays and sound. You can even use your company logo or other graphics, type in messages or set up Slide Show style presentations.



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MUSTS for your PC!



Metz ThreadZ File F/X

\$74

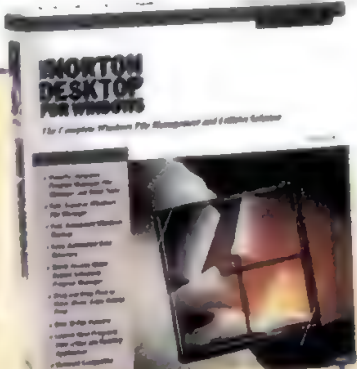
F/X File Manager harnesses the full power of DOS and Windows without cumbersome commands.

Streamline your everyday file management chores with it's intuitive "point and shoot" operation. It features a task manager, file undelete, file manager, text search and file find.

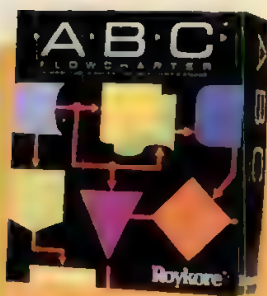
Symantec Norton Desktop for Windows

The Norton Desktop for Windows is the only complete Windows file management and utilities solution. It uniquely integrates the functionality of Windows 3.0 File Manager and Program Manager into one seamless desktop. It also includes automated backup and data recovery and other indispensable productivity tools.

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**Roykore
ABC
Flowcharter**

\$185

ABC Flowcharter is the flow diagram and organization chart program specifically designed to take advantage of today's high speed, graphics-based PCs. It's simple to learn and use with fast and easy drawing tools and object editing, has comprehensive text capability and flexible chart sizes, and extensive printer support

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**Lotus
Freelance
Graphics 4.0**

\$329

Freelance Graphics offers you a graphical WYSIWYG environment unlike any other in the world of DOS. You can work with actual colors and fonts right on your screen and know what your graphics look like before you print. It's loaded with Smart Features-to automate the process of creating show-stopping slides, overheads and handouts.

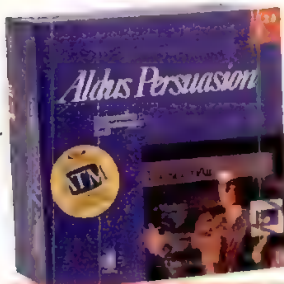
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Allen Comput	Anywhere IV Host&Remote .. 99
Faxit! - Fax II 119	Futuresoft
Compuserve	Dynacomm 3.0 Asynch Vers 190
Compuserve Info. Meb Kit 19	Hayes
Crosstalk Communications	Smartcom Exec 2.0 74
Crosstalk Communicator 58	Hilgrave/Hyperaccess
Crosstalk for Windows 122	5.2.0 DOS/OS/2 114
Crosstalk Mark IV 140	Microcom
Remote II 2.0 106	Carbon Copy Plus 6.0 114
Remote II Host 2.0 78	Prodigy
Datatum Technologies	Prodigy Start Up Kit 26
Procomm Plus 2.0 64	Software Ventures
Delrina Technology	Microphone II For Windows 225
Winfax Pro 75	

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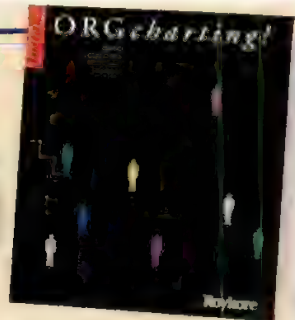
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PROGRAMMING

Asymetrix Corp.	Toolbook 1.5 For Windows	295
Borland International	Borland Objectvision	89
	Turbo C++ 2Nd Ed. V1.0	74
	TurboDebugger&Tools V2.0	110
	Turbo Pascal For Windows	179
	Turbo Pascal Profes.6.0	199
Brightbill Roberts	Hyperpad	78
Digital	Smalltalk DOS V3.0	58
	Smalltalk V Windows Vers	299
	Smalltalk/V 286 1.1	118
Harvard Associates	PC Logo 3.0	55
Knowledge Garden	Knowledge Pro/Windows	399
Microsoft Corporation	Basic Prof.Dev.System 7.1	319
	C Compiler 6.0	315
	Cobol Compiler 4.0	544
	Macro Assembler 6.0	90
	Pascal Compiler 4.0	181
	Quick C 2.5	69
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	Visual Basic For Windows	128
	Windows 3.0 SW Dev Kit	318
	Windows Device Driver Kit	365
Multiscop	Debugger For OS/2	319
	Debugger For DOS	125
	Debugger For Windows	269
Solution Systems	Brief For C++	95
	C-Worthy	325
	Charge	69
	Dbrief	95
	Sourceror's Apprentice	359
Spectra Publishing	Power Basic 2.0	78
Spinnaker	Spinnaker Plus 2.0	275
	True Basic	
	True Basic 2.1	51

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LAN ACCOUNTING SOFTWARE: SUMMARY OF FEATURES

Products listed in alphabetical order

	AccPac Plus	CYMA Professional Accounting Series	Data Pro Accounting Series	Great Plains Accounting Series	The IBM Platinum Series	Libra
INVENTORY						
Maximum number of item-code characters	21	30	20	15	18	12
Maximum number of price levels per item	6	26	10	Unlimited	Unlimited	16
Allows multiple warehouses	■	■	■	■	■	■
Cycle count field	■	□	□	■	■	■
Committed quantity	■	□	■	■	■	■
Last sale date	■	□	■	□	■	■
Selling and purchasing units of measure	■	■	■	■	■	■
Lead time for reorder	□	■	□	■	■	■
Inventory costing:						
Average	■	■	■	■	■	■
Standard	■	■	■	■	■	■
Last-in-first-out (LIFO)/First-in-first-out (FIFO)	■	■	■	■	■	■
Maximum number of layers for FIFO	5	Unlimited	20	Unlimited	Unlimited	16
Tracks serial numbers	■	□	□	■	■	□
Price by customer class	■	■	■	■	■	■
Price by product class	■	■	■	□	■	□
Physical-count-processing functions	■	■	■	■	■	■
Bar code label printing	□	□	■	■	■	□
INVENTORY REPORTS						
Inventory price list	■	■	■	■	■	■
Physical count variance register	■	□	■	■	■	■
Back-order fill report	■	□	■	■	■	■

■ — Editors' Choice

■ — Yes

□ — No

UNIX AND MAC PLATFORMS

Great Plains is the only product reviewed that also has comparable offerings for both Macintosh and Unix platforms. While these environments cannot share data files, information can be easily transferred.

Utilizing a Btrieve database, *Great Plains* integrates with many third-party Btrieve products. *Magic PC* and *Forest & Trees* are packaged and supported by *Great Plains*, and a comprehensive third-party directory lists a wide range of solutions for vertical industries.

Technical support is a *Great Plains* hallmark. The first company to offer guaranteed callbacks within an hour, *Great Plains* is still committed to that policy. The *Great Plains University*, a training curriculum for users and installers, is offered in major cities.

Great Plains is an extremely well-rounded package that comes with industry-leading technical support and a big family of third-party vertical applications.

The IBM Platinum Series by Peggy Joscher

If your search for the perfect accounting system has left you as frustrated as an alchemist struggling to change base metals into gold, consider *The IBM Platinum Series*, from Advanced Business Microsystems, marketed by IBM Desktop Software. This dynamic and flexible package not only manages basic accounting functions, it also provides configurable user interfaces, strong reporting, and a wealth of tools to develop custom queries, reports, and applications. A joint U.S. marketing agreement added the IBM logo to Version 2.0 of the U.S. product, which was released in March 1990. Most modules are priced at \$795.

Enhancements have been lean since *Platinum* shared *PC Magazine's* Editors' Choice award (September 26, 1989), but error checking has improved and context-

sensitive help screens and new documentation have been added. *Platinum's* versatility remains unchanged, though harnessing this versatility requires implementation planning by a consultant savvy in accounting software configuration.

SUITABILITY TO TASK

The IBM Platinum Series

	1	2	3	4
Usability			✓	✓
General accounting			✓	✓
Auditing			✓	✓
Customization			✓	✓
Multuser accounting				✓

Platinum's menus are clean, uncluttered, and logically arranged. Data entry screens resemble business forms layout and are consistent from module to module, which helps reduce training time.

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PACIFIC
DATA PRODUCTS

PRICE WATERHOUSE REPORT LAN ACCOUNTING SOFTWARE

FLEXIBLE REPORTS AND WINDOWS

Platinum distinguishes itself in its Reporting module. You can obtain different views of data by choosing from the many sorting options: Specify ranges of items or wildcards, print transactions in summary or detail, restrict the data to be viewed either by date or status code, and save the parameters for future use. Data can be output to printer, screen, or disk file, or, with the Enhanced Spreadsheet Interface (\$595), to a *Lotus 1-2-3* file complete with @ formulas.

The Resource Manager (\$495) lets you customize menus to access custom applications or third-party products directly. User-defined help screens can document anything from company procedures to details of processing instructions, and lookup windows are available in almost every field. The Resource Manager lets you tailor windows to include information in the files or in other Btrieve databases so that you can, for example, sort and display your O/E customer lookup window by telephone number.

Platinum lets you add vendors and customers during transaction entry, but be aware that the program will let a user add entries even though you specified in security setup that the user cannot perform customer and vendor maintenance. You can, however, print a report listing the records added by quick maintenance. Otherwise, security is one area where *Platinum* excels, allowing you to restrict access to each menu choice by user and to specify read-only or full access.

PERFORMANCE

Platinum's performance was impressive; it finished second in our composite rankings. If you want to get invoices out in a hurry, *Platinum* gets the job done, with the best performance by far in that area. *Platinum* also had the best times on our data entry test, and this strong showing may be due partially to the fact that it was the only package tested that opted not to check inventory quantities on hand during order entry.

SEAMLESS VERTICALS

Platinum does not permit customized screens and forms, but vertical applications with the look and feel of *Platinum* can be developed to integrate with the database. Other tools access the database to export, import, update, and create reports. Modules that extend functionality include Job Cost, Bank Book, Point of

Sale, and a manufacturing module good for light assembly.

For large or growing companies, *Platinum*'s virtually unlimited file sizes and excellent network performance can alleviate worries of outgrowing the system. You can save and access transaction histories to create trend analysis reports or to find out what a customer purchased two years ago. When you exceed disk capacity, you can partition files across multiple volumes or hard disks.

For start-up companies, ABM has *Access to Platinum* (\$249), an inexpensive low-end package. Local ABM-authorized VARs provide classroom training, and telephone support is now available on an annual or quarterly basis. *Platinum*, Version 2.1, should be shipping by the time you read this evaluation.

Built on a solid foundation and gaining maturity in features, *Platinum* outdistances the competition in sophisticated reporting, user configurability, capacities, and development tools. Companies anticipating growth and increasing demands for information should place this product at the top of their list.

Libra

by Edward Kneitel

Libra from Libra Corp. is a powerful program that's well-suited to companies that have sophisticated and unique accounting requirements and whose users can take advantages of customizable data-entry screens and the ability to set hundreds of parameters for each module. The

price per module is \$795 (except for Order Entry, which is \$1,295).

Module design is based on a traditional menu-driven user interface with the abil-

SUITABILITY TO TASK				
Libra	1	2	3	4
Usability		✓		
General accounting			✓	
Auditing			✓	
Customization			✓	
Multitask accounting	✓			

ity to customize menu screens for individual users, a capability that enhances both security and ease of use. Function-key commands allow you to move between setup, processing, report, and utility menus.

Since *Libra* has numerous configuration options, installation requires substantial planning. The program's security system—available at both application and module option levels—lets you establish user groups to set up numerous users.

FLEXIBLE LEDGER

The power behind *Libra*'s G/L is its ability to build custom financial statements. Users have complete control over account inclusion through the use of masking and wildcarding, totaling, dollar masking, and column layout. Account numbers are limited to eight characters and allow flexibility in design. You can define up to 99 companies within one database and consolidate all companies for reporting purposes.

Table & List Maintenance TLM-61H

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
FORM HEADER LIST					
PO	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx
Inv Des:	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx
Shp Via:	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx
Tar Dt:	xxxxxx		A/R	xxxxxx	Rep
Ship Dt:	xxxxxx		Cash	xxxxxx	xxxxxx
Ord Dt:	xxxxxx		SLS	xxxxxx	xxxxxx
Inv. Dt:	xxxxxx		Frst	xxxxxx	xxxxxx
Met Due:	xxxxxx		Frst Exp:	xxxxxx	Labels
			Frst Pay:	xxxxxx	xxxxxx
			Mags	xxxxxx	xxxxxx
PrePd \$:	xxxxxx		Tax	xxxxxx	xxxxxx
Points \$:	xxxxxx				xxxxxx
Phy Frq:	x	Phone	xxxxxx		xxxxxx
Bill To:	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx
Ship To:	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx
A/R UC1:	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx
			CR Max:	xxxxxx	xxxxxx
			A/R Bal:	xxxxxx	xxxxxx

Line: A C1 13 C2 14 C3 15 C4 16 C5 17 C6 18

The screen-tailoring capabilities within *Libra*'s Order Entry module let you customize header and line-item fields for more streamlined data entry.

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PERFORMANCE TESTS: LAN ACCOUNTING SOFTWARE

PC Magazine Labs and Price Waterhouse put each accounting package through strenuous performance, concurrency, and fault tolerance tests to help you evaluate each package in the light of your own needs. Programs incorporating Btrieve fared best, and Macola is the performance leader.

HOW WE TESTED

Since so many of today's PC-based accounting systems run on LANs, a program's ability to operate effectively in a multiuser environment can be critical to its success.

Our tests are similar to those we conducted in our September 26, 1989, review ("LAN Accounting Software: Up to Speed on the PC Platform"); however, we significantly increased the size of our test database. It now includes 5,000 customers, 45,000 A/R detail items, 6,500 G/L accounts, 75,000 G/L transactions, 20,000 inventory items, 2,000 vendors, and 18,000 A/P detail items.

For our tests, we used two identically configured 486-based Compaq Systempros with 8MB RAM and 400MB of disk space. Each Systempro had a Compaq 32-bit EISA Token-Ring controller.

The LAN topology was an IBM 4-megabit-per-second Token-Ring with IBM Type 3 (UTP) cabling. We used Novell's LAN operating system *NetWare 386*, Version 3.10. Additionally, *Macola Accounting Software*, *The IBM Platinum Series*, and *Great Plains Accounting Series* utilized Novell's Btrieve, Version 5.15, a *Netware Loadable Module*.

Each LAN had 10 workstations, consisting of Compaq 386Ns with 5MB RAM and 40MB hard disks. The workstations all used Proteon 1347 4-megabit-per-second Token-Ring network interface cards. (After generating the IPX file, we discovered that Version 3.00 of the Proteon LAN option does not support the peer-to-peer communications required by *Solomon III*. Therefore, in testing that

product, we used Version 3.02 of the Proteon LAN option to generate the IPX file. The performance characteristics are identical.) Quarterdeck Office Systems' *QEMM-386*, Version 5.0, was installed on each workstation so that the keystroke macros used to simulate data entry could be loaded into high memory.

We allowed the accounting software vendors to configure *NetWare* and the workstations to their specifications. Our only rule was that no product, hardware or software, could be added to the configuration. One exception was made for *Solomon III*, which requires either a dedicated database server or an auxiliary processor. Following the vendor's recommendation, we installed a 16-MHz Cubix 386SX auxiliary processor in the Systempro, which was to act as the dedicated database server.

DEFINING THE TESTS

The testing routine encompassed common accounting tasks. First, we tested order entry (Data Entry Degradation). By using keystroke macros, we were able to simulate one, three, five, seven, and finally ten workstations performing concurrent order entry. Since macros "type" faster than any human can, our test of ten workstations can actually represent a workload 5 to 15 times as heavy.

Our second set of tests involved report printing (Degradation During Reporting). Each program was required to print ten reports (two or more from each module) one at a time and then print the same reports concurrently. All reports were printed

WHAT THE NUMBERS MEAN

Either *Macola Accounting Software* or *The IBM Platinum Series*, two Btrieve-based packages, won every test, with the exception of the Financial Statement Printing test, which was won hands down by *Solomon III*. But the biggest winner overall was the LAN itself. By proving once again that it can process databases between 60MB to 75MB with speed that many minicomputers can't match, the LAN asserts itself as a cost-efficient and flexible place to do heavy-duty accounting. Remember, though, that it doesn't matter how fast an accounting system is if it can't meet your business's operating requirements. A program's features are as important as its speed.

to spool files to prevent printer performance from affecting times. The files were archived for later validation.

In the third set (Concurrent Printing of Reports), we combined the previous tests by concurrently having five workstations perform order entry and then print a report. This real-life scenario shows what happens when different users do different accounting tasks at the same time.

In the fourth set of tests, we prepared invoices and checks and posted the detail from each operation through to the general ledger (Invoice Preparation and Detail Posting). Some of the packages required different steps to conduct these tasks; our results include the total time to get the detail into the G/L.

We ran two additional tests, Mixed Processing and Financial Statement Printing, to simulate day-to-day accounting procedures. Finally, we conducted several tests unrelated to speed, including file/record/field locking and fault tolerance. We tested locking by having two users simultaneously access a customer record and attempt to alter it. We tested fault tolerance by powering down the workstation during the middle of a posting routine. Highlights of these results are included in the reviews.

To ensure the integrity of the tests, we conducted them with the accounting software vendors present for assistance. Timing was done with stopwatches or by using the LAN's system timer; the results were recorded by Price Waterhouse and verified both by the vendors and by PC Magazine staff.

■ The **Mixed Processing** test is the most indicative of a day-to-day accounting environment, combining both data entry and reporting. Data entry consisted of five workstations entering five orders of five line items each. The other five workstations were simultaneously printing an Order Entry Open Order Report, an Accounts Receivable Customer List, an Aged Trail Balance, an Inventory Stock Status Report, and a Detail General Ledger.

Macola easily beat its closest competitor by close to 25 percent.

■ The **Data Entry Degradation** test shows what happens to performance when you add users who are entering orders. The first time through, we entered five orders with five line items, each from one station. We then increased the load to three, five, seven, and ten workstations, with each station simultaneously adding five orders. Degradation is a measure of the time difference between entering the orders standalone and the average for each station entering those orders under load, expressed in the graph as a percentage of the former timing.

Platinum was the speed champ on this test. *Macola*, which finished second, suffered the least degradation while processing ten workstations' input. It's important to note that *Platinum* was the only package that did not check available inventory quantities during order entry. Skipping that step aided in its first-place finish.

■ The **Degradation During Reporting** test required the software to print ten reports from the Concurrent Printing of Reports test, first with a single active user and then with all ten workstations processing at once.

Macola and *Platinum* had the fastest times, and *CYMA Professional Accounting Series* and *Libra's* degradation percentages were both under 2 percent—very impressive considering the tremendous load placed on the network.

■ In the **Concurrent Printing of Reports** test, we printed reports that would normally be used to perform a quick check-up on a company's condition:

- The stock status report assumed that all 20,000 inventory items were maintained in one warehouse and that each item was on a single line with its part number, description, in-stock and on-order quantities, price, and calculated value.

- The A/P aging report added 18,000 detail items to 2,000 vendor master records based on a 30-, 60-, 90-, and over-90-day aging scheme.

- The A/R aging report added 45,000 detail items to 5,000 customer master records based on the same aging scheme.

- A/R statements were printed for each of the 5,000 customers and included all of their 45,000 detail items.

- Two A/R customer lists of the 5,000 customers were printed to test the sorting power of each system; one report was sorted by customer name and the other by customer number.

- For the same reason, two A/P vendor lists of the 2,000 vendors were printed, one sorted by name and the other by number.

- Since everything was to be posted to the General Ledger, the year-to-date detailed trial balance involved printing and adding approximately 75,000 detail items to 6,500 individual accounts.

- The summary trial balance report showed the balance of the 6,500 accounts.

Macola, whose reports contained the largest amount of data (over 18MB), was the overall winner and, surprisingly, was more than six times as fast as the slowest finisher (*CYMA*). *Great Plains* doesn't let most other A/R reports print while A/R statements are running, so we printed the statements from another identical company to simulate the effects of concurrent processing. *Libra* could not produce a vendor report sorted by number, so two reports were sorted by name. *Solomon III* could not print simultaneous

vendor and customer reports sorted by number, so its A/P and A/R master file reports were sorted by name. *CYMA* and *Libra's* A/R Statements and the *Data Pro Accounting Series' YTD Detailed Trial Balance* took longer than our time limit of 5 hours, so their times for these tests are not reported.

■ In the **Financial Statement Printing** test, two financial reports that summarized the 6,500 accounts and 75,000 transactions were printed: a one-column year-to-date Balance Sheet and an Income Statement with year-to-date, month-to-date, and percentage of sales. *Solomon III* had the best times on this test.

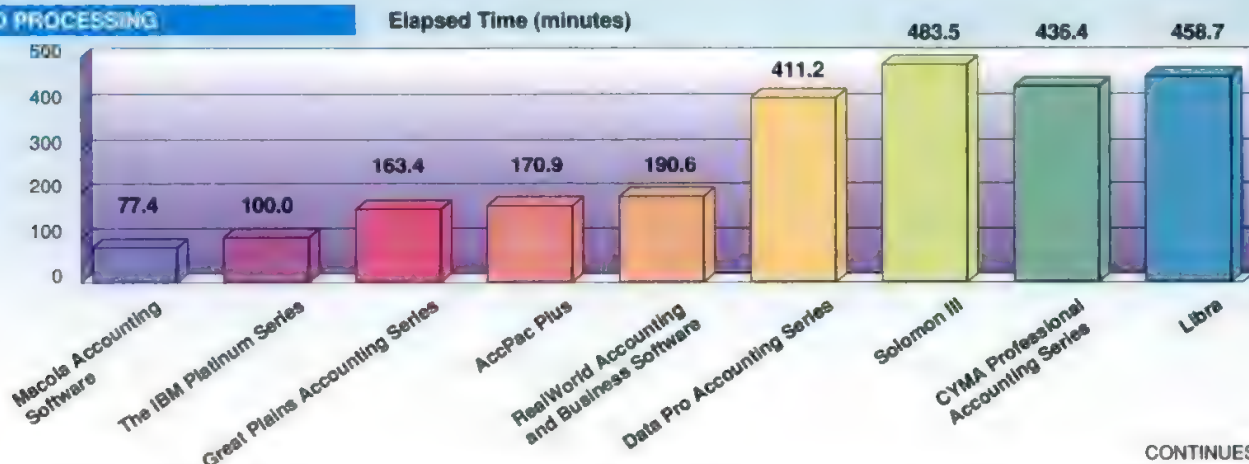
■ The **Invoice Preparation and Detail Posting** test required the products to print 75 invoices and post the invoice detail to the General Ledger, Inventory, and Accounts Receivable files. Where times are not reported, the processes are combined into other steps.

Platinum did the best job of getting the invoices out in a hurry and recording that information into the books.

■ The **Overall Performance** scores summarize how each package performed in each major accounting task category on these performance tests: mixed processing, data entry, report printing, and invoice processing. The results for each category are added together to obtain a grand total time for the completion of all tests.

Note: Due to rounding off, the sum of the numbers in a given column will not always match the total precisely.

MIXED PROCESSING

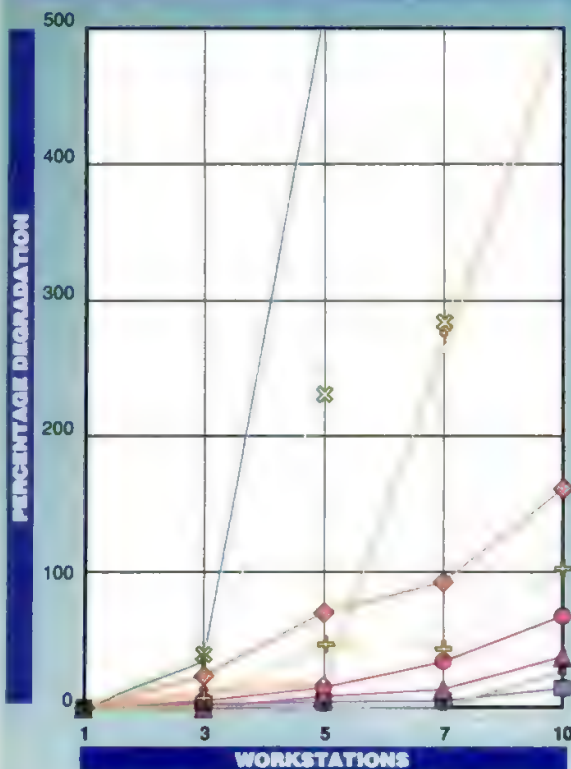


CONTINUES

PRICE WATERHOUSE REPORT LAN ACCOUNTING SOFTWARE

PERFORMANCE TESTS: LAN ACCOUNTING SOFTWARE

DATA ENTRY DEGRADATION



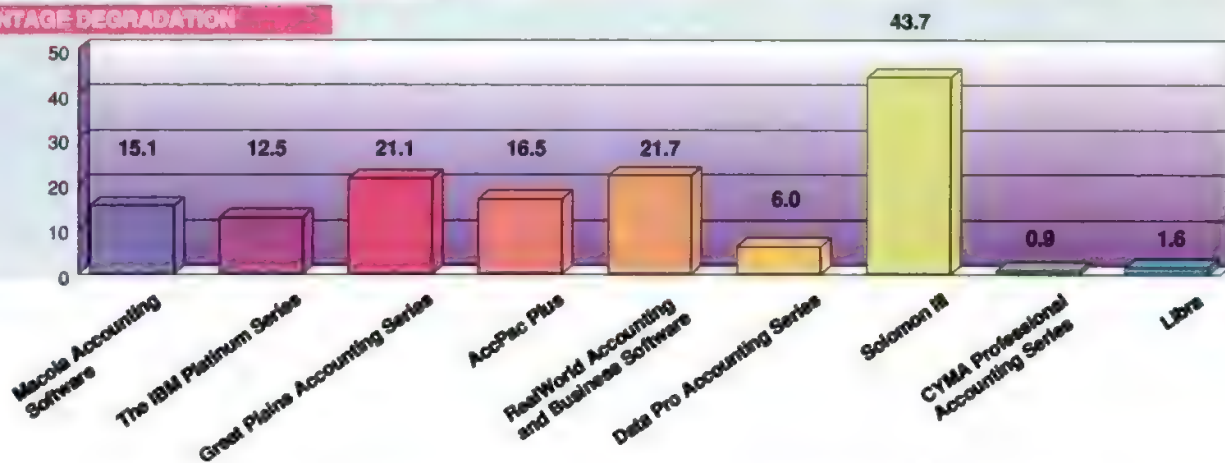
- Macola Accounting Software
- The IBM Platinum Series
- Great Plains Accounting Series
- AccPac Plus
- RealWorld Accounting and Business Software
- Data Pro Accounting Series
- Solomon III
- CYMA Professional Accounting Series
- Libra

	One Workstation Elapsed Time (minutes)	Three Workstations Elapsed Time (minutes)	Five Workstations Elapsed Time (minutes)	Seven Workstations Elapsed Time (minutes)	Ten Workstations Elapsed Time (minutes)
Macola Accounting Software	0.8	2.5	4.3	6.0	9.4
The IBM Platinum Series	0.4	1.1	1.9	2.8	4.8
Great Plains Accounting Series	1.0	3.0	5.5	8.9	15.9
AccPac Plus	1.1	4.2	9.5	15.1	29.2
RealWorld Accounting and Business Software	1.2	4.1	7.3	32.0	148.1
Data Pro Accounting Series	0.7	2.4	5.4	7.4	14.8
Solomon III	0.6	2.3	9.1	14.8	33.8
CYMA Professional Accounting Series	1.0	3.0	5.0	7.0	12.6
Libra	2.0	7.9	60.1	242.1	614.3

DEGRADATION DURING REPORTING

	Macola Accounting Software Elapsed Time (minutes)	The IBM Platinum Series Elapsed Time (minutes)	Great Plains Accounting Series Elapsed Time (minutes)	AccPac Plus Elapsed Time (minutes)	RealWorld Accounting and Business Software Elapsed Time (minutes)	Data Pro Accounting Series Elapsed Time (minutes)	Solomon III Elapsed Time (minutes)	CYMA Professional Accounting Series Elapsed Time (minutes)	Libra Elapsed Time (minutes)
Individual Report Printing Total	135.4	150.4	250.3	295.1	469.2	550.1	580.2	1,036.9	917.0
Concurrent Report Printing Total	159.5	171.9	317.0	353.4	599.1	585.2	1,030.7	1,046.4	932.1

PERCENTAGE DEGRADATION



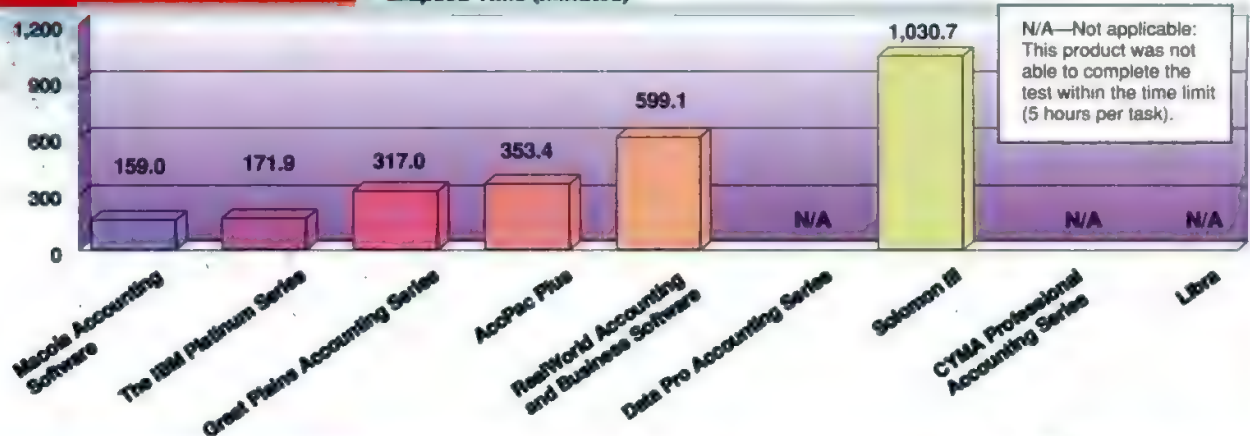
PRICE WATERHOUSE REPORT LAN ACCOUNTING SOFTWARE

CONCURRENT PRINTING OF REPORTS

Individual Tasks in the Concurrent Printing of Reports Test	Macola Accounting Software Elapsed Time (minutes)	The IBM Platinum Series Elapsed Time (minutes)	Great Plains Accounting Series Elapsed Time (minutes)	AccPac Plus Elapsed Time (minutes)	RealWorld Accounting and Business Software Elapsed Time (minutes)	Data Pro Accounting Series Elapsed Time (minutes)	Solomon III Elapsed Time (minutes)	CYMA Professional Accounting Series Elapsed Time (minutes)	Libra Elapsed Time (minutes)
Detail Inventory Stock Status	15.7	21.2	52.6	54.3	44.4	25.6	97.2	68.8	193.1
A/P Aging Report In Detail	28.6	16.2	19.7	10.3	26.2	27.3	73.6	57.1	176.5
A/R Aging Report In Detail	29.6	36.5	53.0	54.4	79.3	82.0	244.9	188.7	91.5
A/R Statements	44.7	41.0	82.7	139.7	251.7	132.0	265.3	N/A	N/A
A/R Customer List Sorted on Customer Name	5.8	5.8	2.2	12.5	9.9	4.7	59.5	75.0	22.2
A/R Customer List Sorted on Customer Number	5.3	5.5	5.3	5.5	9.9	5.7	59.5	63.4	20.2
A/P Vendor List Sorted on Vendor Name	1.8	2.8	2.2	3.0	4.1	2.0	15.6	29.7	9.7
A/P Vendor List Sorted on Vendor Number	1.7	2.5	2.1	2.9	4.1	1.8	15.6	26.4	4.1
YTD Detailed Trial Balance	25.3	39.8	61.3	53.0	93.3	N/A	195.2	161.3	72.5
YTD Summary Trial Balance	1.1	0.7	36.1	17.8	76.3	4.1	4.5	76.1	42.1

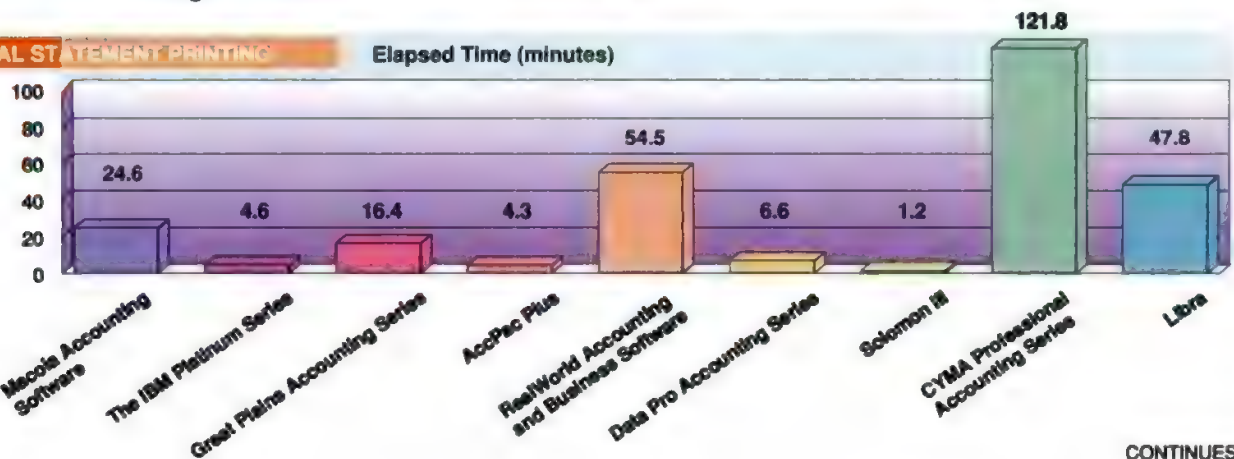
TOTAL

Elapsed Time (minutes)



FINANCIAL STATEMENT PRINTING

Elapsed Time (minutes)



CONTINUES

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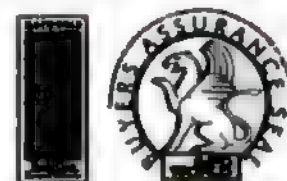
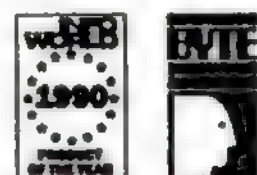
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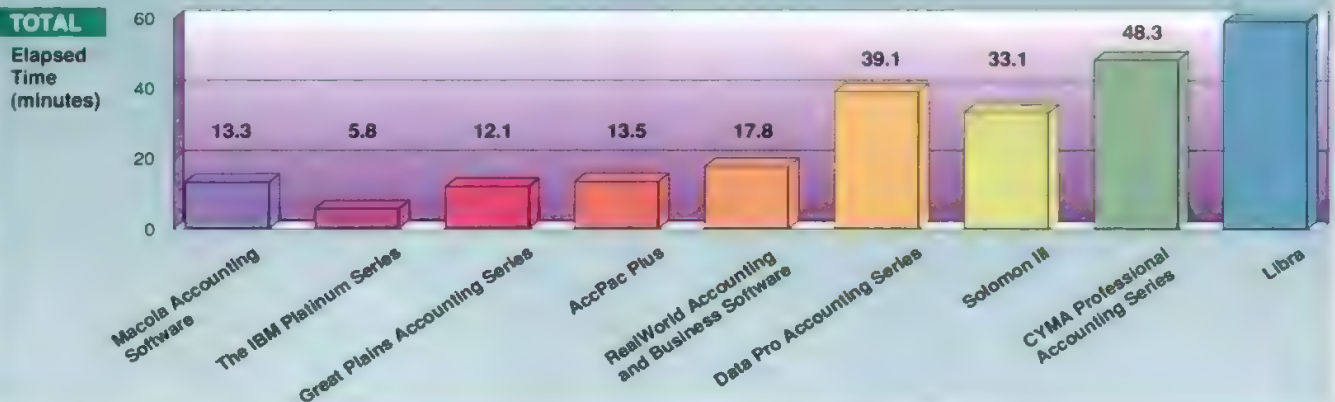
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PRICE WATERHOUSE REPORT LAN ACCOUNTING SOFTWARE

PERFORMANCE TESTS: LAN ACCOUNTING SOFTWARE

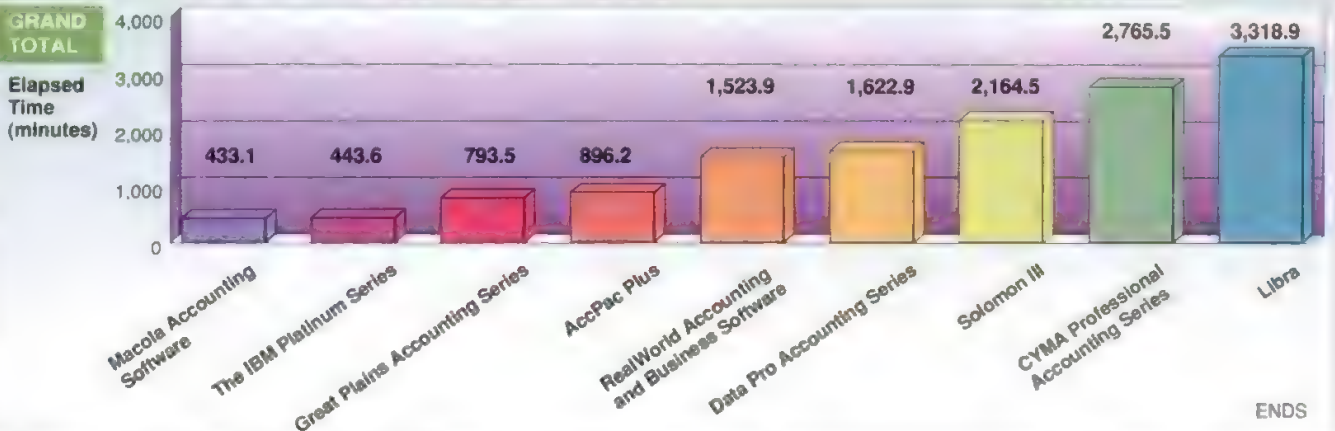
INVOICE PREPARATION AND DETAIL POSTING

Individual Tasks in the Invoice Preparation and Detail Posting Test	Macola Accounting Software Elapsed Time (minutes)	The IBM Platinum Series Elapsed Time (minutes)	Great Plains Accounting Series Elapsed Time (minutes)	AccPac Plus Elapsed Time (minutes)	RealWorld Accounting and Business Software Elapsed Time (minutes)	Data Pro Accounting Series Elapsed Time (minutes)	Solomon III Elapsed Time (minutes)	CYMA Professional Accounting Series Elapsed Time (minutes)	Libra Elapsed Time (minutes)
Post Order Entry File	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0
Print & Post Orders	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0
Print A/R Invoices	3.9	1.4	1.1	3.7	3.7	21.9	3.5	12.2	8.4
Post Invoices to A/R Files	7.7	3.4	6.1	1.0	11.6	0.0	21.3	24.3	25.9
Post A/R to G.L.	1.7	1.0	5.0	6.0	2.5	17.2	8.4	11.8	0.0



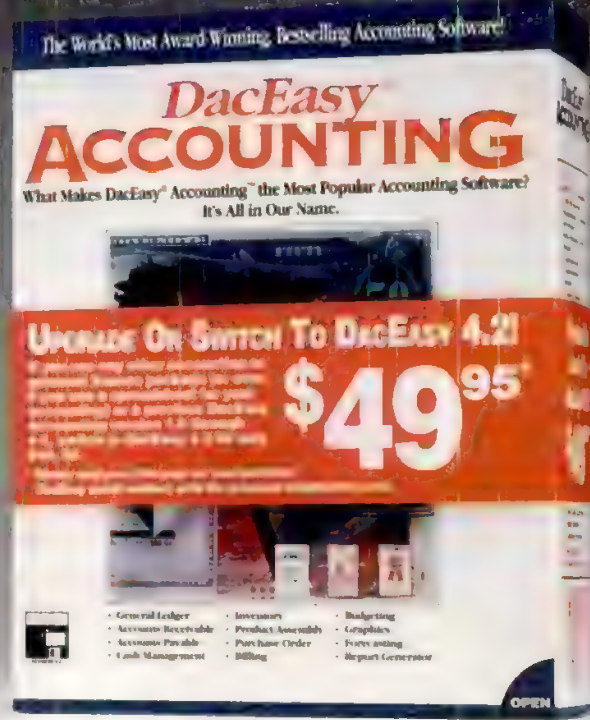
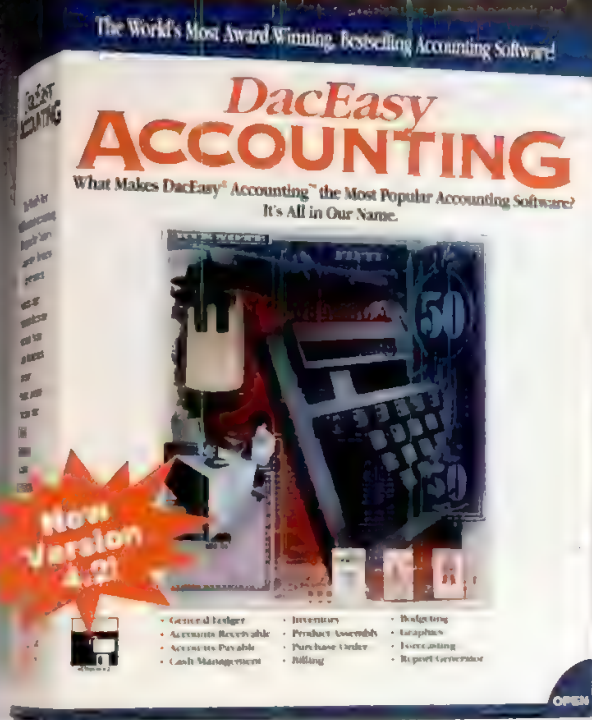
OVERALL PERFORMANCE

	Macola Accounting Software Elapsed Time (minutes)	The IBM Platinum Series Elapsed Time (minutes)	Great Plains Accounting Series Elapsed Time (minutes)	AccPac Plus Elapsed Time (minutes)	RealWorld Accounting and Business Software Elapsed Time (minutes)	Data Pro Accounting Series Elapsed Time (minutes)	Solomon III Elapsed Time (minutes)	CYMA Professional Accounting Series Elapsed Time (minutes)	Libra Elapsed Time (minutes)
Mixed Processing	77.4	100.0	163.4	170.9	190.6	411.2	458.7	483.5	436.4
Data Entry Total	23.0	10.9	34.2	59.0	192.7	30.7	60.6	28.6	926.3
Individual Report Printing Total	135.4	150.4	250.3	295.1	469.2	550.1	580.2	1,036.9	917.0
Concurrent Report Printing Total	159.5	171.9	317.0	353.4	599.1	585.2	1,030.7	1,046.4	932.1
Financial Statement Printing Total	24.6	4.6	16.4	4.3	54.5	6.6	1.2	121.8	47.8
Invoice Preparation and Detail Posting Total	13.3	5.8	12.1	13.5	17.8	39.1	33.1	48.3	59.3



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PRICE WATERHOUSE REPORT LAN ACCOUNTING SOFTWARE

Reporting on non-financial information, such as head count or square footage, is aided with *Libra's* statistical accounts. With the copy feature, you can add new departments easily, and *Libra* will calculate and prepare encumbrance, recurring, and percentage journal entries.

ACCOUNTS PAYABLE

Master file setup for vendors includes check stub options (no stub, detail stub, remittance advice only) and the ability to delete vendors based on a period of inactivity. *Libra* does not maintain a standard terms table; it requires entry of invoice due dates, discount days, and percent discount for every vendor.

There is one oddity to this otherwise complete A/P system: The program posts the checks to the G/L and master files before printing. This can add many journal entries (and headaches) if checks are subsequently voided.

You can build a price file containing items you purchase routinely, which speeds data entry and creates line-item histories for each item. *Libra* allows you to base invoice payments on the payment cycle for each invoice, such as next, skip, or hold.

With *Libra's* single-fund processing utility (\$250), you can enter vouchers for multiple companies within the same batch while creating proper postings to inter-company A/P or Due To/From accounts. Another optional utility (\$500) lets you print checks directly on a laser printer and include company name and bank information directly on blank check paper.

A/R TIMESAVERS

Libra's master file entry allows for multiple ship-to addresses and finance charges, which can be calculated, but unfortunately, not posted to the G/L. Commissions are calculated on an invoice as a whole, and entries are created to reflect commissions accrued, earned, and payable. A time-saver allows users to enter invoices and receipts in the same batch, with separate batch reporting.

***Libra* lets you build a price file for routinely purchased items, speeding data entry and creating line-item histories.**

O/E is a good complement to the Inventory and A/R modules. *Libra* maintains sales representative and commission tables and has numerous calculation methods. You can apply prepayments against an order, and expense or charge freight to the customer.

Flagging an entire order as a shipped order takes a single keystroke, allowing users easy transfer from order to batch invoice status. *Libra* will print invoices on demand, along with orders, packing slips, and shipping labels. Invoice form layouts are fully customizable.

O/E does not support blanket orders, nor can it track release dates at the line-item level. To help overcome these limitations, the program has a Recurring Orders feature and allows individual items to be released for invoicing.

INVENTORY COSTING

Libra's Inventory module limits item numbers to 12 characters. Valid costing methods are FIFO, perpetual LIFO, or periodic LIFO with up to 16 cost layers. You can calculate each item unit cost as a fixed amount, weighted average, last cost, or percentage of sales.

Unfortunately, there is no automated physical inventory function. Physical Count worksheets can be printed, but the software does not adjust quantities based

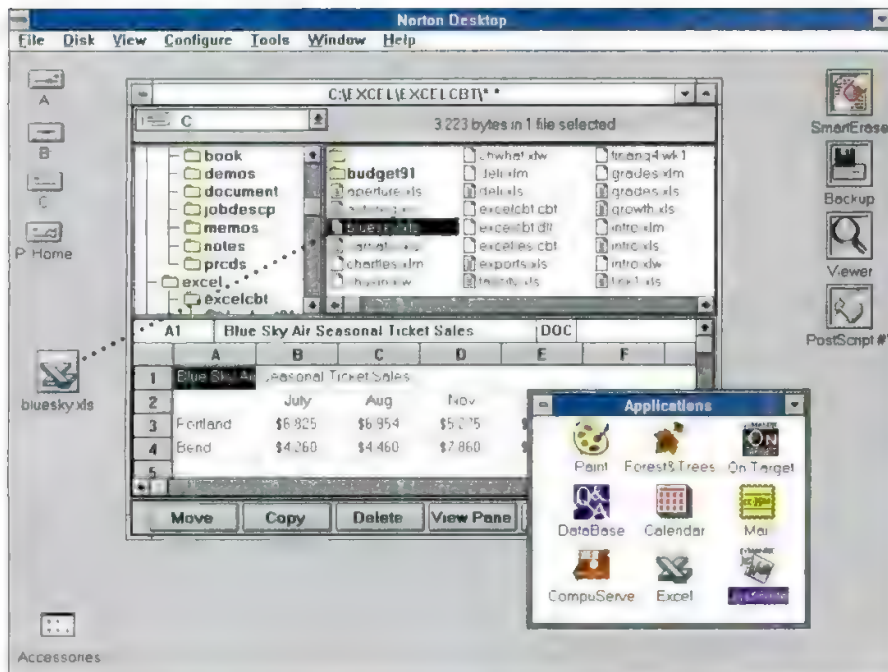


FACT FILE

Libra
Libra Corp., 1954 E. 7000 South, Salt Lake City, UT 84121; 800-453-3827, 801-943-2084.
List Price: \$795 per module (\$1,295 for Order Entry), four-user network module, \$1,500, each additional three-user module, \$1,500; system manager, \$195.
Requires: 640K RAM, DOS 3.0 or later.
In Short: *Libra* is a flexible and functional system that you can customize from top to bottom for your business needs. Its limited help facilities and weak documentation make it harder to use than it should be.

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—PC Computing, August '91

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Houston	Harper & Pearson Company	713 622-2310
UT Sandy	Accounting Systems, Inc.	801 571-1222
VA Falls Church	Applied Acctg Technology	703 876-0077
WA Bellingham	Eftord Company	206 734-3300
Bellevue	Business Software, Inc.	206 455-4401
Bellevue	Grayson & Associates	206 552-7498
Seattle	Accounting Software	206 496-5231
Spokane	Northwest Accounting Group	509 747-0488
WI Madison	Solutions, Inc.	608 833-4747
Madison	Checks & Balances	608 276-4041
WV Parkersburg	BSSI	304 295-4151

PRICE WATERHOUSE REPORT LAN ACCOUNTING SOFTWARE

on the physical counts.

Libra has a limited Purchase Order module that does not integrate with Inventory. All inventory payment and receipt information is entered through A/P. In addition to the ones evaluated, *Libra* has extremely robust Job Cost and Property Management modules.

All batch processing can be performed using separate transaction files, so that batches can be updated by user or by type of transaction. Each module has repetitive transaction capabilities for functions such as recurring billing, invoices, and journal entries.

PERFORMANCE TESTS

Libra's performance was unimpressive on PC Labs' benchmark tests; it finished at the bottom overall. It's interesting to note, however, that *Libra* had only 1.6 percent degradation on our report degradation test. While our tests did not utilize a math coprocessor, *Libra* contends that the use of a coprocessor will significantly improve performance. In fact, *Libra* recommends the use of a math coprocessor on every machine on the network to improve processing time.

The voluminous documentation that accompanies the package is hard to navigate, a limitation amplified by on-line help being available only in the G/L. Unfortunately, *Libra* does not offer the large number of third-party products that most other packages provide. If, with all the flexibility built into *Libra*, you still need additional program modifications, *Libra* will make source code modifications for you. Support is provided directly from *Libra* or through VARs.

A substantial rewrite of this program, called *ExAcct*, will offer comprehensive, context-sensitive help screens, improved documentation, pull-down menus, a completely revamped interface, and a multicurrency module. The *ExAcct* G/L is currently available, and its A/R and A/P modules are scheduled for release later this year.

If you can afford the time and patience to refine *Libra* for your specific requirements and are able to cope with the lack of on-line help and the package's weak documentation, then *Libra's* customizable data entry screens, user-defined menus, and comprehensive reporting can offer you an extremely flexible and powerful accounting solution.

Macola Accounting Software

by Suzanne M. Colvin

A comprehensive, feature-rich program that runs exceedingly well in high-volume LAN environments, *Macola Accounting Software*, Version 5.0, has a core set of accounting modules supplemented by industry-specific modules. *Macola* prices the standard modules at \$795 each, the distribution modules—O/E, Purchase Order, Inventory, and Bill of Materials—at \$895 each, and the manufacturing modules—MRP, Shop Floor Control, and six others—at \$1,595 each.

INTERFACE IMPROVEMENTS

Version 5.0's improved user interface now supports drop-down menus, color screens, and full-screen editing. Unfortunately, *Macola* did not enhance the design of the data entry screens (except in A/R) so that they would display more than one trans-

SUITABILITY TO TASK				
	1	2	3	4
Usability			✓	✓
General accounting			✓	✓
Auditing			✓	✓
Customization				✓
Multitask accounting				✓

action at a time. For example, to complete a journal entry, you enter the debit, the program refreshes the screen, and then you enter the credit. This awkward single-line approach is seen in G/L, A/P, O/E, and Purchase Order.

Now you can design custom-formatted invoices, purchase orders, and statements, and create macros to perform repetitive tasks. The new version also includes an extended G/L account number, improved password control, and the ability to process service invoices. *Macola* is the only product that lets you choose between the Btrieve record manager and its traditional COBOL-based ISAM files.

Macola's G/L allows account numbers up to 15 characters long, divided into three user-defined segments. You can track up to 99 budgets by account and by period and maintain unlimited transaction and

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TASAS DIARIAS		TASAS PERIÓDICAS		UTILIDADES	
FECHA	COMPRA (C/C)	VENTA (C/P)	FECHA	COMPRA (C/C)	VENTA (C/P)
01/01/89	1.24	1.24			
02/01/89	1.24	1.24			
03/01/89	1.24	1.24			
04/01/89	1.24	1.24			
05/01/89	1.24	1.24			
06/01/89	1.24	1.24			
07/01/89	1.24	1.24			
08/01/89	1.24	1.24			
09/01/89	1.24	1.24			
10/01/89	1.24	1.24			
11/01/89	1.24	1.24			
12/01/89	1.24	1.24			

Exchange rates can be managed with Platinum Foreign Currency Manager, shown here with an optional Platinum Language Set.

Now there is a world of difference between The Platinum Series and any other accounting software. That's because Platinum® is the only LAN-based accounting software designed to handle the demands of today's international marketplace. If you do business with foreign suppliers or customers, or if you have offices or subsidiaries overseas, then you'll appreciate the multinational capabilities that Platinum delivers in force:

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- The optional Platinum Language Sets allow you to switch back and forth between different languages via a menu option, and you can even bill your customers in their native languages, in either their foreign currency or your home currency.
- Platinum supports international formats for dates, numbers, and addresses.

The key to Platinum's international know-how is the new Foreign Currency Manager module, which allows you to process and report transactions in any number of different currencies used by your customers and suppliers.

Over 100 New General Accounting Features

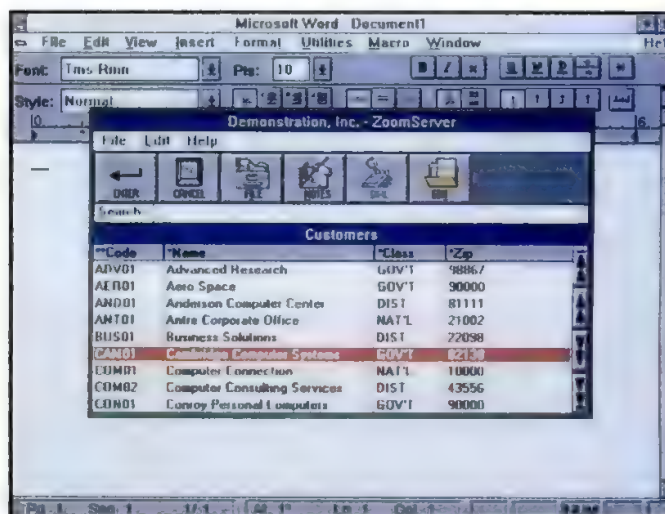
We didn't just internationalize the new Platinum Series, we added over 100 new general accounting features as well. Features like accrual vouchers, and the ability to track discounts, locations, request dates, shipping dates, and freight for each line item on an invoice. What's more, we've greatly enhanced our financial report writer, FRx, which was already widely recognized as the most powerful financial reporter available on anything smaller than a mainframe.

The Platinum Series continues to provide the most powerful platform for accounting and management information available on PCs and LANs. With over 20 modules, Platinum provides solutions for almost any type of business.



Powerful Windows 3.0 Integration Utilities

ABM has also just released an exciting new utility that allows you to access your Platinum accounting data from within any Windows application that supports Dynamic Data Exchange (DDE). This utility extends your computing workplace, allowing your favorite Windows™ applications to use Platinum accounting data for purchasing, sales support, credit collections, human resources, warranty tracking, and similar purposes.



Platinum Windows Utilities allow you to view and retrieve Platinum data from within any Windows DDE application.

Access to Platinum: Graphical Accounting for Small Business

This fall ABM has also released Access to Platinum, an entry level accounting system that runs under DOS in character mode, and in WYSIWYG graphical versions under Windows 3.0 and OS/2® 2.0. Access to Platinum customers whose

The screenshot shows the 'Check' form with fields for Bank, Balance, Date, No, Pay to the Order of, and Amount. A 'Profile' window is open, displaying a list of customers and employees. The 'Check' form has a date of 06/24/1991 and a balance of 5182.65. The 'Pay to the Order of' field is filled with 'Customer 101' and the amount is \$125. The 'Profile' window shows a list of customers and employees with columns for Code and Name.

Code	Name
BANK	Bank of America
CUST101	Customer 101
CUST102	Customer 102
CUST103	Customer 103
EMPLOY1	Employee 1
EMPLOY2	Employee 2

Access to Platinum uses a WYSIWYG forms metaphor, so that computerized forms look like their paper counterparts.

accounting requirements grow over time will be able to upgrade their accounting data directly to The Platinum Series. And until December 31, you can upgrade from any competitor's accounting system to the Windows or OS/2 version of Access for only \$79, or to the character version for \$49.



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The Platinum Series: a Partnership of IBM and Advanced Business Microsystems.

The Platinum Series is marketed by IBM within the United States, and is available through IBM Authorized Platinum Series Resellers. For more information on how The Platinum Series can help your business, please call IBM at 1-800-IBM-7699 ext. 555.

For Platinum Series sales outside the United States, and for information both domestically and internationally about Access to Platinum, Platinum Language Sets and the Platinum Windows Utilities, please contact Advanced Business Microsystems at 1-800-999-1809 (or 1-714-727-1250 if calling from outside the USA).



* Latest Platinum Series version number: 2.1 in the USA; 2.5 internationally.

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budget detail. If available disk space is tight, *Macola* lets you compress transaction detail into summary line items by month, date, source code, or a combination of the three.

The financial report writer allows you up to 13 columns and can include actual and budget data for current and prior years or periods. It also stores and prints footnotes on the financial statements. Account-number masking would be a helpful enhancement here.

VENDOR PERFORMANCE STATS

Macola's A/P vendor file contains a number of useful statistics on vendor performance, such as average lead time, cost variance percentages, and number of P/O line items arriving late in the current year. In case you wish to capture data that doesn't have a place in the master file, *Macola* allows you to create seven user-defined fields associated with each vendor record.

The A/P module also gives you the ability to set up multiple cash and A/P accounts, void checks before and after posting, and set up automatic distribution templates for each vendor. Unfortunately, you can't add vendors on the fly during voucher entry.

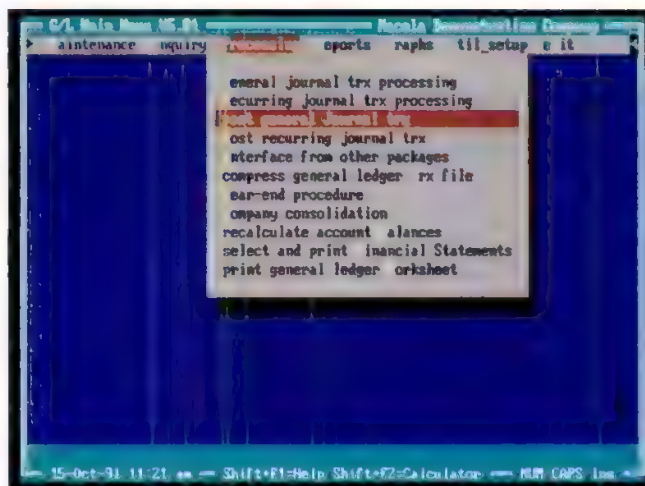
A/R FOR THRIVING SALES

Macola's A/R module has the necessities to support a thriving sales-oriented company. It tracks customer performance data useful to sales managers, such as average days to pay, number of invoices to date, highest account balance, and last sale and payment dates.

If you bill customers for services rendered, *Macola's* service billing feature, although not extensive, does an adequate job. For each type of service, you set up the unit (such as hours), the price per unit, and the cost. You can even calculate commissions for services rendered.

PRICING MATRIX

Macola's pricing capabilities exceed those of any other package we reviewed. You can set up a pricing matrix by customer, customer class, product, product class, or a combination, with a maximum of ten quantity breaks per matrix. Pricing is calculated as a discount from price, as a fixed dollar amount, or as a markup from average, last, or standard cost. The addition of contract pricing by customer, including start and end dates, would make a



Version 5.0 of *Macola* has a new look with pull-down menus and color screens. Not only is the redesign more eye-pleasing, it's also more logically laid out than previous versions.

great feature even better. You can also create quotes and add customers on the fly, although no user security check is performed to validate the user's right to add customers.

Commissions can be calculated from amount of sale, gross profit, or a percentage of cost, price, or margin, and can be split among a maximum of three salespeople. The program allows multiple ship-to fields, each with its own UPS zone and sales tax code. You can also create quotes and add customers on the fly.

Macola provides an ample number of features for O/E, including the option to display credit history, specify ship date and discount percentage by line item, or display substitutes for out-of-stock items.

TARGET INDUSTRIES

It's not surprising that *Macola's* Inventory module is powerful, given that it's such a critical module for distributors and manufacturers, *Macola's* target industries. The Item Master file consists of 69 fields (more if you're using the manufacturing modules) and tracks such useful information as usage, lead times, reorder information, and target margin.

Macola supports ABC inventory coding and cycle counts. The program will suggest items to be coded A, B, or C, based on usage, and will adjust coding upon request. In addition, *Macola* will suggest cycle count selections within the ABC groups and will record cycle count adjustments.

PERFORMANCE

On PC Labs' tests, *Macola* was the top performer. It had the fastest standalone and concurrent report printing and mixed

processing times and second-fastest data entry time. Its speed earned it the fastest composite time, and in the light of all of the functionality the program offers, performing at this level is quite a feat.

EXTENDING FUNCTIONALITY

If you need additional functions that are not supplied in *Macola's* core or vertical modules, you have several options. First, there are a number of software products that work in conjunction with *Macola* to provide such functions as shipping manifests, point of sale, and electronic data interchange (EDI). Additionally, the *Micro Focus* COBOL program source code is available (\$795 to \$1,595 per module), and the introduction of the *Btrieve* version of the product puts a greater number of useful add-on products and development tools at your disposal.

By the end of this year, *Macola* expects

FACT FILE

EDITORS' CHOICE

Macola Accounting Software, Version 5.0
Macola Inc., 333 E. Center St., Manon, OH 43302; 800-468-0834, 614-382-5999
List Price: \$795 per accounting module; \$895 per distribution module; \$1,595 per manufacturing module; single-user system manager, \$195; multiuser system manager, \$595.
Requires: 640K RAM, DOS 3.1 or later.
In Short: *Macola* offers excellent LAN performance, many sophisticated features designed to meet the difficult needs of distributors and manufacturers, and a wide selection of vertical applications.

CIRCLE 426 ON READER SERVICE CARD

What's The Best Value You Can Buy Today In A Portable Computer?



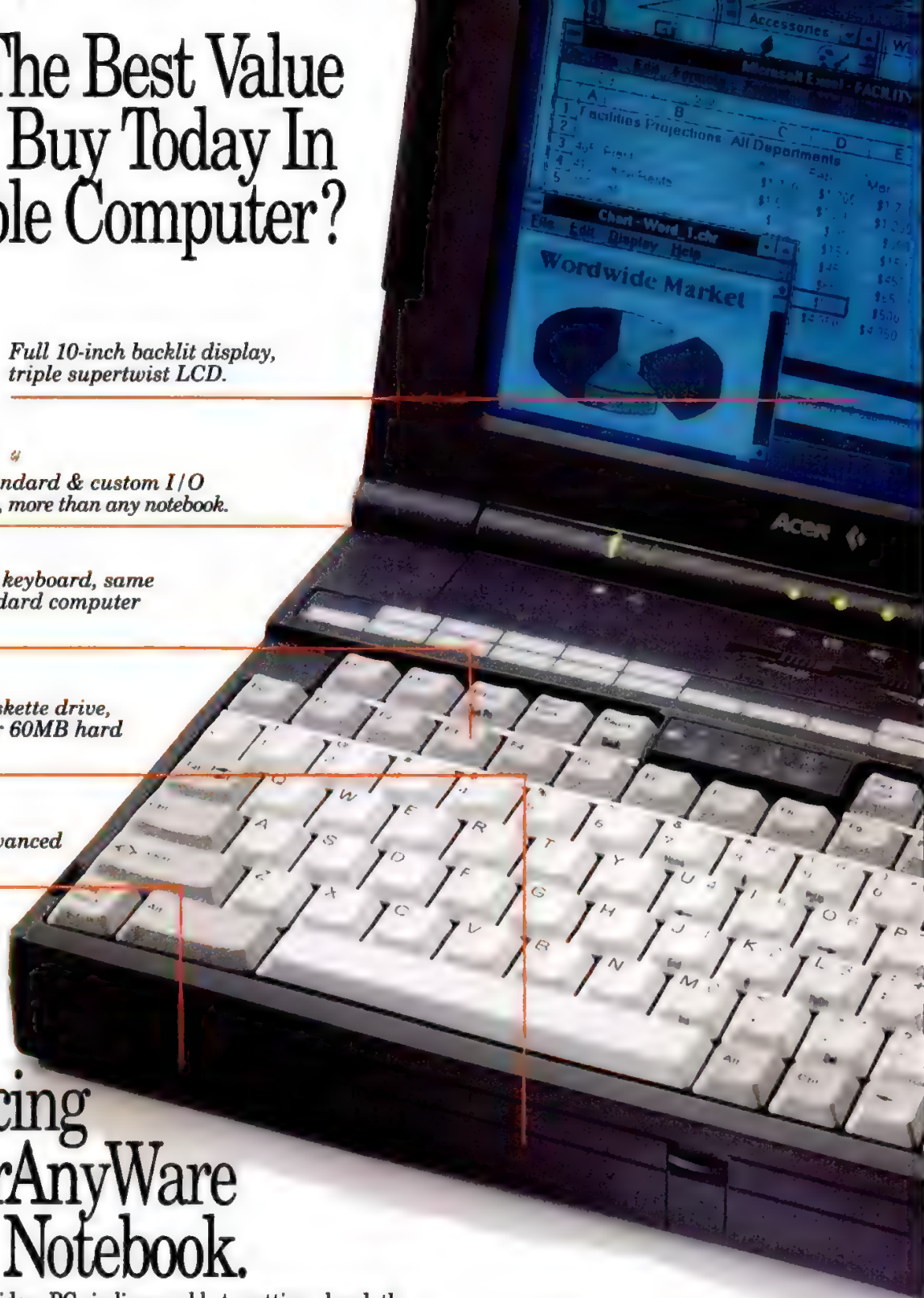
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SOFTWARE LAN ACCOUNTING SOFTWARE

to release products that support Novell's relational database engine for LANs, *NetWare SQL*. *NetWare SQL* data dictionary files (DDF) for *Macola* will allow front-end development tools such as Gupta Technology's *SQL Windows*, Borland International's *ObjectVision*, Channel Computing's *Forest & Trees*, and *Microsoft Excel* to access *Macola* files. *Macola* also expects to release a *NetWare SQL*-based product by year end.

Users have a variety of support options, ranging from update-only support, priced at \$75 per module, to premium phone support that guarantees 1-hour call-back and includes updates and newsletters for a \$3,500 annual fee. Training is available through local, licensed resellers and consultants, and through *Macola* personnel for \$100 per hour plus travel and expenses.

Built on a comprehensive set of features, plus a wide range of third-party products, *Macola* offers the distributor and manufacturer an accounting package that's a real performer on a network. If you expect the most out of your accounting system, get *Macola*.

RealWorld Accounting and Business Software

by Jean A. Tyrell and Terry M. Ferrer

RealWorld Corp., an accounting software vendor for over a decade, has added many features to the latest edition of *RealWorld Accounting and Business Software*. Version 6.0 comprises 17 fully integrated accounting modules, priced at \$695 per DOS module.

In addition to the standard distribution and job cost modules, *RealWorld* has industry-specific modules. For professional services billing, the Professional Invoicing module has custom forms design and interfaces with Inventory and Receivables. The Sales Management Solutions module provides a method of tracking and organizing sales prospects and integrating this information with the accounting modules.

Supplementing *RealWorld*'s impressive pull-down menus is the Access Manager, which lets you define hotkeys to maneuver within the software. For ex-

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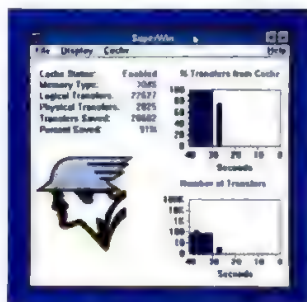
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ample, while entering a customer's order, you can pop out of the O/E screen, open the customer file maintenance screen, add that customer, and then return right back to the O/E screen where you left off.

Although data entry screens are a bit simplistic and unimaginative, *RealWorld's* menu flexibility allows you to define additional menu selections, whether they are DOS commands or batch file commands. Another productivity feature lets you create and attach notes to master-file data.

INTEGRATING VERTICALS

RealWorld's G/L is designed to integrate with numerous vertical products that suit individual businesses' needs. You can define the length of two account segments up to eight digits each. *RealWorld's* latest version has recurring entries that allow for allocations based on a percentage or fixed dollar amount. These entries must be manually selected and posted. Improved financial reporting capabilities allow

account ranges, wildcards, and accounting ratios in defining financial reports.

In case you're particular about the information shown in your G/L, *RealWorld* allows you to compress transaction detail by month, date, source code, or any combination of the three.

ENHANCED A/P AND A/R

Incorporating many enhancements, *RealWorld's* Accounts Payable module has most of the features you would expect to find in a quality high-end package. An

TWO SHORTCUTS TO THE RIGHT ACCOUNTING SOFTWARE

by Lawrence Walkin

How do you decide which accounting software is best for your business? Two companies, which are run by accounting consultants, offer software programs that will help you choose.

The Accounting Library, from Solutions, is a tool designed to help end users and accounting consultants select the right accounting software from the dozens of packages on the market. Consisting of a five-book reference set and a software analysis program, the \$479 package contains excellent advice on the entire accounting-software selection process. The books, written by Solutions' president Charles Chewing, have been on the market for a year.

The software contains data on 78 PC-based accounting packages. In order to obtain the information, Solutions sends out 53-page surveys of yes/no questions to vendors of accounting software. There are, of course, problems with this research method. A question may be general enough that a vendor, trying to act in the company's best interest, will feel justified in answering yes, no matter what. For example, in the Order Entry section of the questionnaire, one question reads "Supports special customer requirements?" Why not answer yes, no matter how much work may be required?

When Solutions receives the responses from the vendor, it doesn't independently verify them. Instead, it promises to exclude any vendor who is caught answering yes when the answer should be no.

The Accounting Library includes information about G/L, A/P, A/R

(including purchasing), payroll, inventory, fixed assets, job costing, O/E, and budgeting, and the software can segregate products into DOS, Unix, or Macintosh categories. It does not let you input your own list of desired features to generate a list of packages that satisfy your needs, but this feature will be added in a future release.

Vertical markets are not covered by *The Accounting Library*, and the package does not distinguish between high-end



and low-end accounting products. Promotional brochures from the software vendors are included.

A different approach is taken by Computer Training Services' *Guide to Accounting Software for Microcomputers*. This \$495 package covers only 22 high-end accounting programs, but the details about those programs are provided by independent reviewers, not by the vendors themselves.

The features of each package are listed in tables, as they are in *The Accounting Library*, but *Guide* also includes long

reviews that outline both the positives and the negatives of the software. *The Requirements Analyst*, a Lotus 1-2-3 template that lets you evaluate and prioritize up to 700 attributes of accounting software, is included with the package. The template performs an analysis based on your input to yield a list of software that best meets your needs.

While both these packages will help you to narrow down the list of accounting systems you should consider, they don't claim to provide the ultimate solution. Accounting neophytes will still need to seek expert advice to find the perfect fit for their organizations. But going to the experts with a short list is better than going with no list at all. ■

The Accounting Library, Version 2.0

Solutions, 587 Southlake Blvd., Richmond, VA 23236; 804-794-3100.

List Price: \$479; *The Accounting Library* (LE), \$279; annual subscription, \$100.

Requires: 512K RAM, DOS 2.0 or later.

CIRCLE 418 ON READER SERVICE CARD

Guide to Accounting Software for Microcomputers

Computer Training Services, 11708 Ibsen Dr., Rockville, MD 20852; 800-433-8015, 301-468-4800.

List Price: With *The Requirements Analyst* (Lotus 1-2-3 template), \$495; with one semiannual update, \$605; with two updates, \$695.

Requires: 384K RAM, DOS 2.1 or later.

CIRCLE 419 ON READER SERVICE CARD



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Platinum was designed for uncompromised power and extraordinary flexibility. From two to 22 fully inte-

grated modules can be used in any combination, so Platinum can start small, grow with you and be customized in the future. Its functions range from basic bookkeeping to sophisticated management accounting (in DOS, OS/2® and LAN versions). What's more, Platinum expands easily from a single user to a network of many users.

Power and Performance.

Platinum offers superior performance, speed and capacity. In fact, no matter how many modules you use and how large the network becomes, the power of Platinum remains uncompromised.

Most important, Platinum

offers the service and support of IBM's network of authorized Platinum dealers and installers.

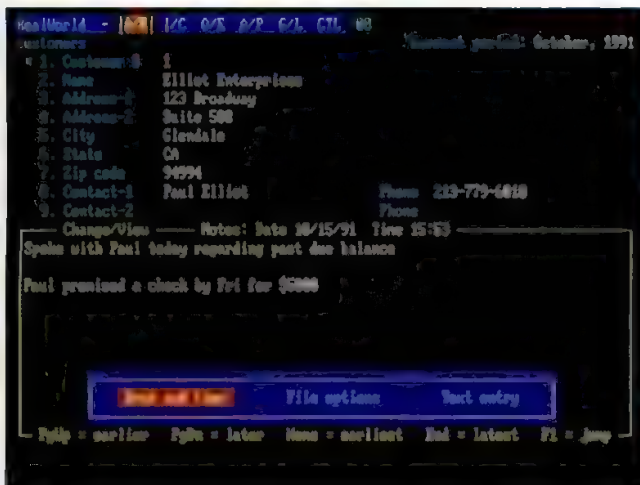
In a nutshell, nothing grows with your business like Platinum.



The classic IBM logo, consisting of the letters "IBM" in a bold, blue, eight-strike font.

Desktop Software

PRICE WATERHOUSE REPORT LAN ACCOUNTING SOFTWARE



RealWorld lets you create and attach notes to master-file data. These notes allow you to maintain additional information on all master-file records.

unlimited number of cash and A/P accounts are allowed, and the invoice number has been expanded to 15 alphanumeric characters. Vouchers can be distributed to an unlimited number of G/L accounts, and voiding checks now permits the reinstatement of the voucher to the open item file.

If a long customer number is required, *RealWorld's* A/R module allows for a 12-character customer ID number. The ability to have unlimited G/L, A/R, and cash accounts represents welcome additions.

RealWorld's handling of field locking in a LAN environment sets it apart.

While paid invoices were once purged, you can now retain detail by using the optional Customer History File.

RealWorld allows up to ten distribution accounts for recurring transactions and six accounts for non-A/R cash receipts. You can apply cash receipts to customers either manually or automatically. Statement printing allows for many selection and printing options including selection by balance due or aging period, printing of invoice balances only, and inclusion of fully paid items.

ORDERS AND INVENTORY

RealWorld's O/E module supports most businesses with standard distribution

requirements. The system processes orders, prints pick tickets, produces invoices, and displays inventory quantities as orders are entered. Version 6.0 adds a new screen that lets you view several lines of an order at once. You can assign a profit center to an order, line item of an order, or inventory item. Returns may go back to stock or be written off as scrap. Invoice commissions can be based on percentages associated with either customer or salesperson.

Inventory valuation methods include LIFO, FIFO, average, and a modified standard-cost method. With *RealWorld's* new kit-processing ability, you can assemble an item from a set of other inventory items. The program supports an unlimited number of balance sheet inventory accounts and tracks inventory quantities sold, returned, and used for up to 12 periods. You can assign each item one of eight different pricing structures and perform price changes by vendor, product type, subproduct type, category, or G/L account.

LAN ACCESS

RealWorld's unique handling of field locking in a LAN environment sets it apart from the competition. The software permits more than one user to access the same record and edit different fields of the same record at the same time. This is a powerful feature for an organization where multiple users frequently edit master files. *RealWorld's* results in performance testing landed exactly in the middle of all packages tested.

The somewhat awkward data entry screens do not always display a total view of the transactions being entered. In A/P

FACT FILE

RealWorld Accounting and Business Software, Version 6.0

RealWorld Corp., 282 Loudon Rd., P.O. Box 2051, Concord, NH 03302; 800-678-6336, 603-224-2200

List Price: \$695 per DOS-based module; \$895 per Xenix/Unix-based module.

Requires: 640K RAM (2MB extended memory recommended), DOS 3.3 or later.

In Short: *RealWorld* has the lowest cost per module of the products reviewed. With the availability of numerous vertical solutions and source code, the program excels at serving specialized industries.

CIRCLE 427 ON READER SERVICE CARD

invoice entry, the screen displays only three G/L distribution accounts, though many may have been entered. G/L journal entry displays one account distribution at a time.

RealWorld can handle over 1,000 companies, but the installation procedure sets up data files for only a single company. Although *RealWorld* Corp. has

STANDARD TESTING				
	1	2	3	4
Usability			✓	
General accounting			✓	
Auditing			✓	
Customization				✓
Multuser accounting			✓	

made enhancements to the procedure for setting up multicompny fields, and the comprehensive documentation includes a Guide to Daily Operations for each module, the process is still a somewhat confusing one and guidance can be vague at times.

ENTRY-LEVEL TO SPECIALIZED

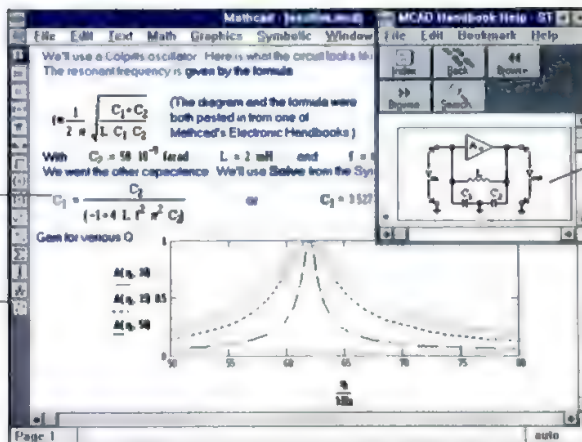
RealWorld addresses small-business needs by providing a wide variety of entry-level packages. *RealWorld 4-in-1 Basic Accounting* (\$249) is a basic solution for companies with G/L, A/P, A/R, and after-

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LAN ACCOUNTING SOFTWARE

the-fact payroll requirements. *Practical Accounting System* (\$495) has all the features of 4-in-1 plus inventory, check reconciliation, and a calculating payroll. RealWorld's *Point-of-Sale Plus* (\$495) combines a POS system with 4-in-1's financial capabilities and a calculating payroll. You can combine a Service Manager module (\$495) with *Point-of-Sale Plus* or *Practical Accounting System* to provide a solution for service and maintenance companies. All entry-level-package data can be easily upgraded for use with the high-end product we reviewed.

One of RealWorld's major strengths is the availability of vertical-market products. They're all listed in an 800-page book published by RealWorld. The company has also developed software for the restaurant, manufacturing, cemetery, legal, and equipment rental fields, to name a few. Source code is available for all RealWorld modules, making it ideal for an environment where customization is a major concern.

Though it isn't flashy, RealWorld is a time-tested product. With plenty of vertical market interfaces and standard features, RealWorld is a viable accounting package

for businesses with specialized requirements.

Solomon III

by Brian D. Callow

Solomon III, Version 7.0, \$795 per module from Solomon Software, has undergone notable changes in the two years since we last evaluated it. The new built-in and add-on utilities enhance the program's overall functionality, which caters primarily to small to midsize service and distribution companies that need a proven, easy-to-use accounting system.

The well-designed user interface has intuitive data-entry screens, pull-down menus, pop-up windows, context-sensitive on-line help, reporting options, and the ability to enter additional master-file items on the fly.

CHECKING G/L ENTRIES

The package's G/L requires you to enter account and department entries on sepa-

SUITABILITY TO TASK

Solomon III

	1	2	3	4
Usability				✓
General accounting			✓	✓
Auditing				✓
Customization			✓	✓
Multuser accounting	✓			

rate screens. While this can be a quick way to add departments, *Solomon* lets you post to any department combination, so you must review all invalid account and department combinations in order to make sure that an account wasn't entered in error.

The program's consolidation feature combines balances from multiple companies, even with dissimilar charts of accounts. Trial balance and detail G/L reports are clear and can now suppress zero balances and print net account activity. *Solomon's* report writer lets you customize financial statements.

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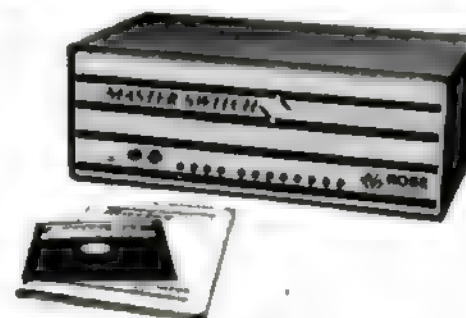
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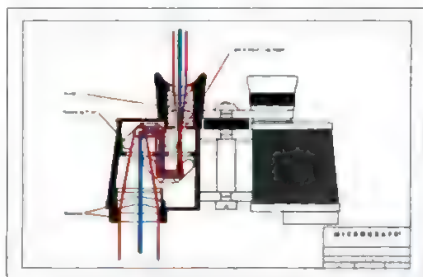
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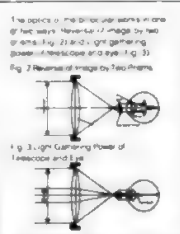


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PRICE WATERHOUSE REPORT LAN ACCOUNTING SOFTWARE

CASH MANAGEMENT

The A/P module is well suited to managing cash requirements, and check processing has many selection criteria. Cash accounting has been added in A/P and A/R, which is a boon to small companies that don't need accrual-basis financial statements.

Solomon's A/R also handles mandatory requirements, including aging analysis, an open-item or balance-forward basis for customer accounts, and statement printing. Formerly included in Sales Analysis, customer sales reporting is now in A/R. You can enter invoices directly or update customers from O/E, as well as display valuable aging, sales, and payment statistics, and open orders.

O/E-TO-INVENTORY LINKS

Solomon's O/E processes quotations, standard orders, regular orders, back orders, blanket orders, and drop-ship orders. Upon customer acceptance, quotations can be automatically converted to invoices. Inventory status is checked during O/E, and alternative items can be queried for in-stock quantities.

Solomon III's Inventory Control Maintenance screen is easy to use, with pop-up table support and quick maintenance available on key fields. Items can be placed into product groups for more flexible reporting.

Solomon III supports six inventory valuation methods and provides multiple location and stock-transfer features that are useful for distribution companies. Comprehensive sales, cost, and quantity statistics are maintained for each item. Care should be taken in designing a part code structure to take proper advantage of the masking feature.

A conversion option lets you stock or

sell goods in units that differ from the units in which they're received. This version of Solomon lets you assemble a single-level bill of materials, with quantities allocated from inventory and associated costs built into the new item.

MODULE INTEGRATION

The Solomon III line also has modules for Purchasing, Fixed Assets, Job Cost-

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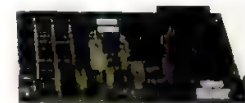
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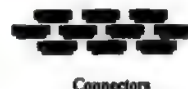
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PC Magazine, December 11, 1990.*

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PC Computing, December 1990.**

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PRICE WATERHOUSE REPORT LAN ACCOUNTING SOFTWARE

FACT FILE

Solomon III, Version 7.0

Solomon Software, 1218 Commerce Pkwy., Finlay, OH 45840; 800-879-2767, 419-424-0422.

List Price: \$795 per module; network manager, \$795 for five-user module.

In Short: *Solomon* is a well-rounded, comprehensive product with many user customization tools, but its poor network performance makes it a poor choice for large installations.



CIRCLE 428 ON READER SERVICE CARD

activity in each module for up to 99 periods and delete transaction history by closing the period or by selecting a delete option. The new Shared Information (SI) feature consolidates elements common to a number of subledgers, such as names, addresses, payment terms, and sales tax information. For example, if you buy from and sell to the same company, its address needs to be set up only once. Such address-file sharing posed a limitation, as we could not simultaneously print customer and vendor reports sorted by name.

An old *Solomon* standard, wildcarding and masking, is available on most fields for every report. By specifying the digits included in each report, you can build significant intelligence into data fields. For example, by specifying ????, you will receive only those records that have a 2 as the fourth digit.

UNPARALLELED FAULT TOLERANCE

Solomon's database logging and process restart features (fault tolerance) are virtually unparalleled among its competitors.

These handy features can save your data in the event of a power outage or system crash. If your system crashes while posting transactions, *Solomon* can rebuild the

Solomon III's new shared information feature consolidates elements common to a number of subledgers.

post directly from the point of crash without restoring from backup or losing any data.

Based on client/server architecture, *Solomon* recommends a standalone database server along with the file server on a LAN. For PC Labs' tests, we used a Cubix auxiliary processor installed directly into

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"There are several features which make the program easy to set up, easy to learn and easy to use." — MacWeek March, 1990

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"Using M.Y.O.B. is simple and direct." — Macworld May, 1990

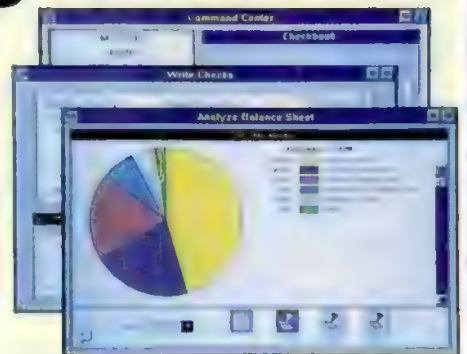
Change anything entered in the current session, automatically reverse entries made in prior sessions.

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Critical Acclaim — Since being released in 1989, M.Y.O.B. for the Macintosh has become the most acclaimed small-business accounting program.

"In the last two years, M.Y.O.B. has received two Eddy-award nominations. As accounting programs go, it packs more punch per dollar than almost any other system on the market. What makes the program different is that it combines the functionality experienced accountants expect with the ease of use novices demand. M.Y.O.B. is a solid, double-entry accounting system that can work in any small business." — MacUser April, 1991

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the server. This is an inexpensive alternative (\$1,695) to a dedicated PC as a database server, but this requirement does make a *Solomon* implementation that much more expensive.

Even with the additional processing power, though, *Solomon's* processing speed was sluggish, ranking in the bottom half of our finalists. This lack of speed may be due in part to the overhead associated with its sophisticated database log-

ging and process restart features.

If you want to print financial statements in a hurry, however, *Solomon* can do the job faster than any other product tested. Although it finished seventh overall, *Solomon* printed reports without LAN contention. *Solomon* displayed the worst performance degradation when printing ten reports simultaneously.

THIRD-PARTY PRODUCTS

Solomon III's external systems interface (ESI) facilitates data imported from third-party packages and from custom software that requires a financial-system front end. A directory of third-party products includes systems for vertical applications, including property management, manufacturing, and point of sale.

Solomon's new menu customization utility permits you to add, modify, or delete menu options, delete entire menus, and add applications. Although not for

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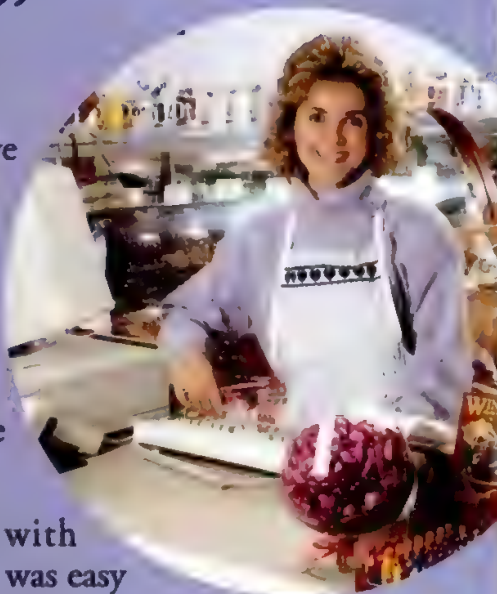
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**Solomon's new
menu-customization
utility does not
require advanced
computer
knowledge**

first-time PC users, this utility does not require advanced computer knowledge. All menu modifications are backed up with an audit report.

With *SolomoNotes*, an add-on to be released this fall, you can record notes related to the field you are currently working on, and create an unlimited number of user-defined pop-up screens.

SOFTWARE SUPPORT

Solomon III is positioned in the middle of the *Solomon Software* product line. *ProfitWise*, a limited version of *Solomon III*, is at the low end (see "Economy Class Accounting," April 10, 1990), and *Impacct*, a LAN-based package using client/server architecture, is at the super-high end.

Solomon provides toll-free technical support, software updates, a bulletin board service, quarterly technical bulletins, and a newsletter.

Solomon III, Version 7.0, has more flexibility than previous releases, and users will be pleased with the ability to tailor the software to meet specific business requirements. *Solomon III* is a well-rounded series of modules catering to businesses looking for a workhorse rather than a racehorse.



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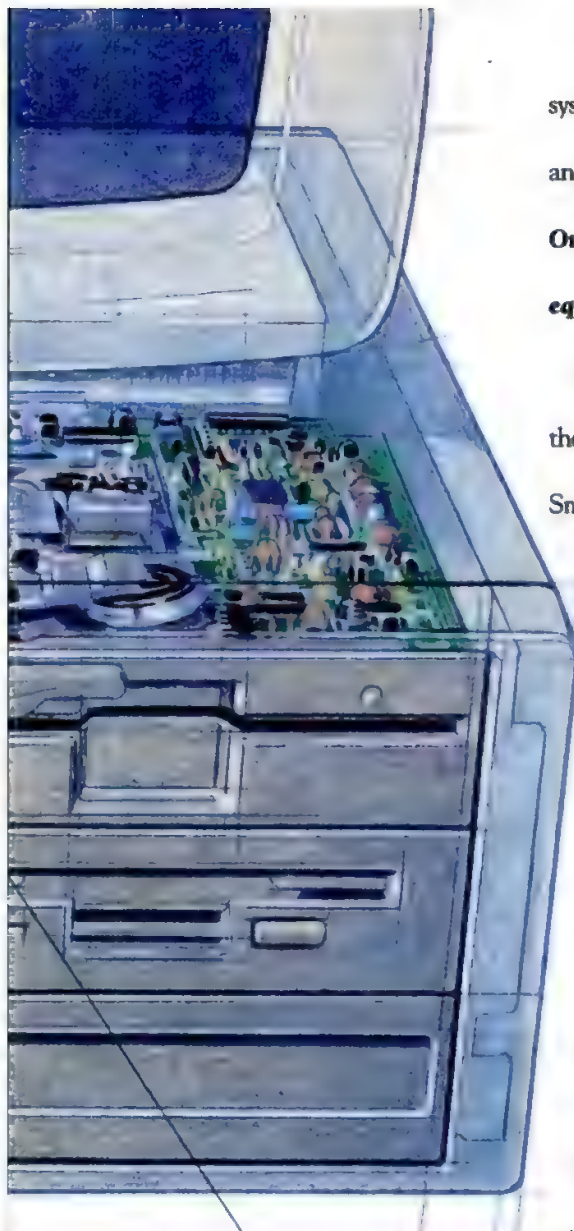
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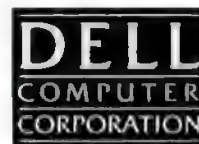
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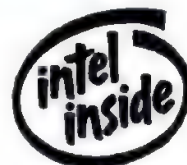
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Once again, editors rave about the Tangent 486.

"...when the full 16 stations included in the test were active. The Tangent Multi-Server 433e was still the fastest..."

PC Week 1/7/91

PC WEEK

Tangent Server Maintains Performance Lead As LAN Size Increases

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American Mitac M12AC 4280G
AT&T Computer Systems StarServer S
Compaq Computer Systempro Model 486-840
Coparc USA 486V/25 EISA
CSS Laboratories MaxSys 486TE-33
Dell Computer System 433TE
Hewlett-Packard Vectra 486
Tangent Computer Multi-Server 433e
The Network Connection Triumph TNL 486/33



"A consistently strong performer across all tests, the Tangent model 433e stands out in this group." PC Magazine April 16, 1991

PC
MAGAZINE
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April 16, 1991
Tangent 433e

PC Magazine, April 16, 1991

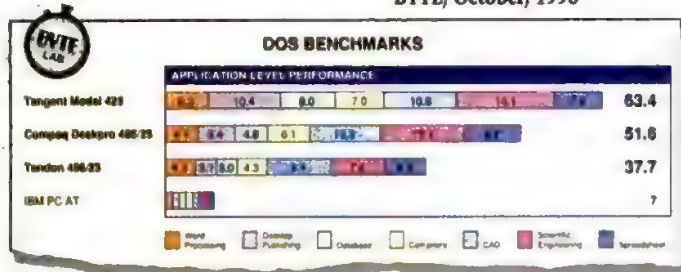
TANGENT COMPUTER INC.

Tangent Model 433e

by Bill O'Brien

Tangent Computer's foray into the realm of the EISA bus is represented by an investment-quality machine.

"The big winner is the Tangent..."
BYTE, October, 1990



When the editors got through writing about Tangent 80486 systems, they didn't leave us a lot to say. Except price. First, compare performance. Then compare price. What you'll see is that Tangent is the price-to-performance leader in 486 systems, with a range of models designed to fit any need.

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SECURING
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Safe Stations For Networks

PCs with special security features can protect sensitive data or programs on your network from theft or virus infection. These ten systems incorporate security options that range from truly diskless designs to special cards or keys for access.

by Alfred Poor



Once again, technology has come full circle.

In the beginning, there were mainframes and minis, and each user had a fairly dumb terminal that provided a peek at the information stored on these systems. Then microcomputers arrived, and users welcomed the power of full-fledged systems to their own desktops. But the architecture that made

IN THIS REVIEW

Accton SlimStation SX
Alloy EarthStation-III
American Mitac MIStation
3S Model MI316S
Apricot LS 386SX

Datamedia NETmate/sx20
Liberty Network Station
Series G
Republic RPM3/E
TeleVideo TS5 TeleStation

Unisys PW² LAN
Workstation/386SX
U-tron 386SX Purple
Diskfree Workstation



SYSTEM PERFORMANCE: A GUIDE TO THE GRAPHICS

THE BARS

The Bars

We created separate charts for 16-MHz and 20-MHz processors. Each colored bar represents the **range** of normalized 16-MHz or 20-MHz test scores, from best to worst. *The longer the bar, the wider the range.* If the best score is more than twice the average, an upward-pointing arrow appears atop the colored bar.

A black arrow on each bar represents a system's **position** within the range. *The higher the arrow, the better the performance.* If a system performs more than twice as well as average, the black arrow appears at the top of the bar, pointing upwards.

The Boxes

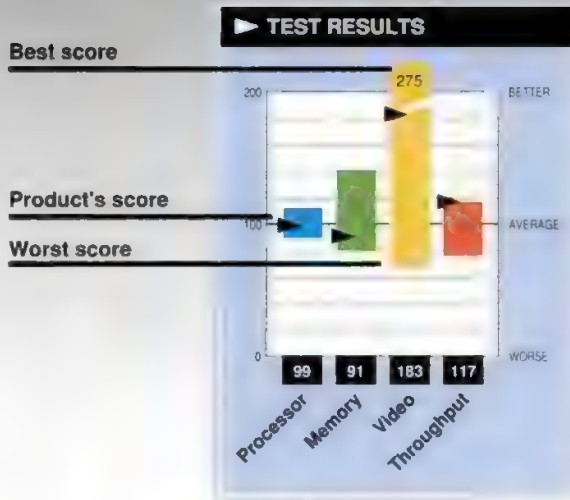
A **normalized score** appears in the box below each colored bar. This number reflects the computer's position compared with others in its processor class, on a scale where the average score is

100 and a larger score indicates proportionally better performance.

For the processor, memory, and video tests, we derived this figure by calculating the average score for all 16-MHz or 20-MHz 386SX machines reviewed in *PC Magazine*, August 1989; January 30, 1990; August 1990; November 27, 1990; and April 30, 1991, as well as those in this issue. We then divided this average by the score of each machine in turn and multiplied by 100.

For the throughput test, we used only the machines reviewed in this issue to define the range. We calculated the average test score for each class (16 or 20 MHz); then, for each machine in the same class, we multiplied the throughput score by the same factor so that the average would come out to 100.

A table of **actual scores** accompanies the three-dimensional bar graphs.



micros so appealing also made them inefficient; each PC was an island with an isolated collection of data. Now, as more and more PCs get connected to LANs, we're witnessing the explosion of micro-computer networks. The workstations are no longer dumb, but users rely heavily on network servers—as they once relied on minis and mainframes—to access programs and data files.

Networks offer advantages hand-in-hand with hazards that grow more serious when PCs are connected, particularly theft of data and computer viruses. As a result, workstations with built-in security features are growing in importance. In this review, we will look at ten 386SX-based secure workstations from Accton Technology Corp., Alloy Computer Products, American Mitac Corp., Apricot in Canada, Datamedia Corp., Liberty Electronics USA, Republic Technology Corp., TeleVideo Systems, Unisys Corp., and Utrion Technologies. These systems provide security in the form of features such as special pass cards or infrared keys as well as by incorporating truly diskless designs.

VIRUSES AND THEFT

Computer viruses pose special threats to networks. If a standalone PC gets infected, the risk that the virus will spread to other machines is present, but not great. If

Networks offer advantages hand-in-hand with hazards that grow more serious when PCs are connected, such as theft of data and computer viruses.

a mainframe gets infected, the damage can be more severe, but there still is only one system to disinfect. But when a virus invades a LAN, the damage can be far-reaching. Since workstations communicate with the network file server to obtain shared programs and data files, a virus can spread rapidly to every computer that logs onto the network. Finding a virus that has spread throughout a LAN can mean that the network administrator has to check not only the server, but the local drive of every workstation attached to it.

A company with a local area network is

vulnerable in other ways. Many LANs contain sensitive and proprietary data: financial information, customer lists, strategic plans, product specifications. While it is important for employees to have access to this information, it is just as important that the data be held securely. Given the ethereal nature of machine-readable information, a user can make a copy of sensitive information onto a floppy disk without leaving any record of the theft taking place.

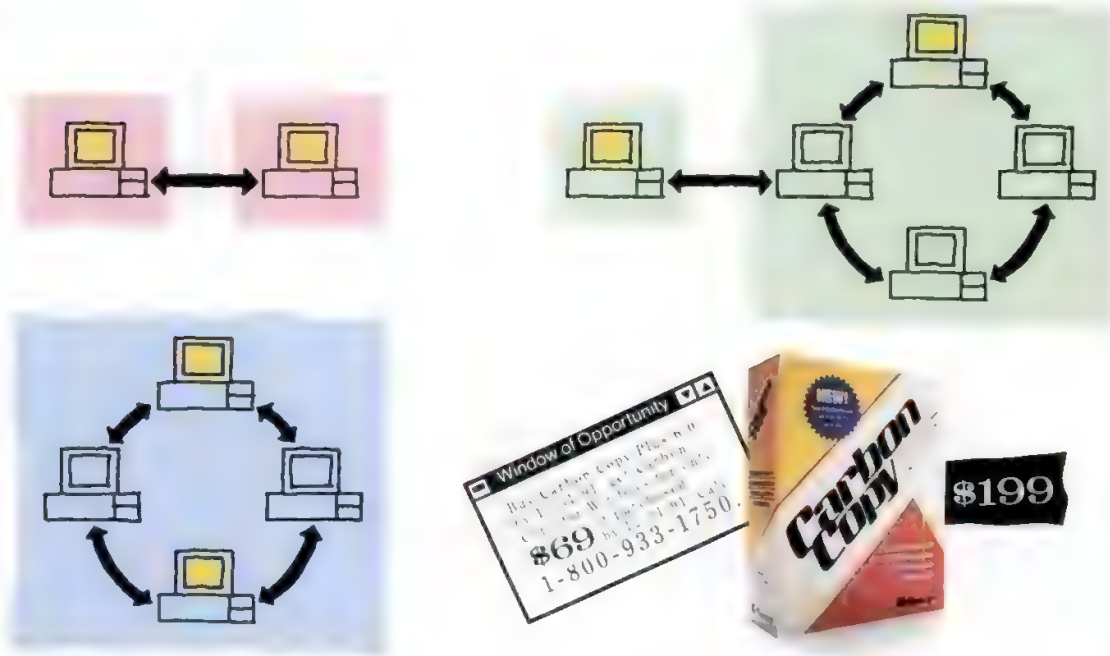
Network operating system developers have tried to build in features, such as log-on passwords and access rights, that make it possible to exert some control over these problems, but LANs still have holes. Some third-party developers have created monitoring and security programs, but these also have limitations.

ULTIMATE SECURITY

The best security for a LAN is a physical solution. For example, if there is no floppy disk drive on the workstation, the user cannot insert infected or Trojan horse programs into the system, or copy confidential information onto a floppy disk and walk off with the company's secrets. Hence, diskless workstations have grown in popularity.

Diskless workstations are not new. They have been available for years from a variety of vendors. These systems have

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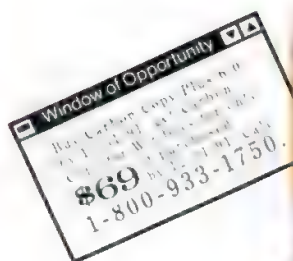
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DRIVING WITHOUT A DISK: Booting Up Diskless PCs

by Frank J. Derfler, Jr.

Standalone PCs go through a start-up process that includes searching the A: and C: drives (if available) for a track of data carrying start-up information. But if diskless LAN workstations by definition do not have disk drives, then where do they find their start-up information? The answer: They get it from a special file located on a PC that acts as a network boot server. Typically, but not always, the network boot server is the network file server.

Diskless workstations need network interfaces able to hold a programmable read-only memory (PROM) chip that gets the start-up information for the PC. Not all adapters can host boot PROMs, but the majority can. Note that the PROM is specific not only to the adapter, but also to the LAN operating system.

Even PCs with a full array of floppy disk drives and hard disks can use the remote-boot process. This capability is handy when people want their PCs configured with specific DEVICE, FILES, LASTDRIVE, or BUFFER statements for network operation, and with different parameters for operating with no network connection. If the boot PROM encounters a local drive, the question "Boot from the network?" typically appears on the screen so that you can choose between local- and remote-boot actions. It's not uncommon to set up remote-boot capabilities on disk-equipped personal computers, just as with their diskless kin.

Novell calls the special file created on the *NetWare* network server the *boot image*. Microsoft's *LAN Manager* uses an OS/2 process the company calls a *DOS remote-boot server* running on the PC designated as the OS/2 *LAN Manager* Boot Server. Other LAN products ranging from Banyan's *VINES* to Artisoft's *LANtastic* also offer remote-boot capabilities.

In the simplest configuration, every PC that boots remotely uses the same boot file, specially configured by the network manager for the role. But

providing specialized boot files for specific client PCs has advantages. Configuring a customized boot file makes it easy to set up PCs as special-function devices, such as remote access servers, electronic mail gateway servers, fax servers, and print servers, particularly when one of these devices requires special configurations in the DOS CONFIG.SYS file. Specialized boot files also let you use different brands of adapters and various IRQ and memory locations in different client PCs on the network.

THE NETWORK TECHNIQUE

Let's use Novell's *NetWare* as an example of how you configure the remote-boot file. Other network products follow the same general model, with the major difference being the names of the programs and the files. We'll look first at a generic file that could be used by any client stations able to use the same CONFIG.SYS, ANET, and IPX files, and then we'll describe the specialized files.

Under *NetWare*, a file called NET\$DOS.SYS contains a complete image of a diskette that the workstation could use to boot from its A: drive. The image includes the hidden DOS files, along with COMMAND.COM, CONFIG.SYS, and AUTOEXEC.BAT. It also includes any other needed .SYS files and the appropriate ANET and IPX programs.

To create the NET\$DOS.SYS file on the server, your initial step is to create a complete physical bootable floppy disk that you would use to start the PC if it had a drive. Then you run a program called DOSGEN, contained on the *NetWare* Install floppy disk and typically located in the file server's LOGIN subdirectory. DOSGEN uses all of the information on the floppy disk to create the NET\$DOS.SYS image in the LOGIN subdirectory. You should flag NET\$DOS.SYS as a shareable read/write file.

This process works fine for a network of homogeneous client PCs. But

in the real world, few networks consist of PCs with exactly the same LAN adapters configured for exactly the same IRQ, using exactly the same video driver, memory manager, and other .SYS files. You often must go beyond this process and configure specific boot-image files for specific PCs. You do this by using DOSGEN to create a floppy disk image with a special name and configuring an ASCII file called BOOT.CONF.SYS to link specific floppy disk images to specific adapter addresses. If the address of an adapter with an autoboot ROM is not in the list, that adapter defaults to NET\$DOS.SYS.

Every Ethernet and Token-Ring adapter contains a unique address burned into a ROM chip. These addresses are internationally controlled to ensure their uniqueness. ARCnet adapters do not have factory-assigned numbers, but their boot ROMs typically include a unique address that serves the same purpose.

To create unique boot files, you must first find the adapter address. In a few rare cases, a sticker attached to the adapter shows it. Almost any network analyzer program will report the addresses of the adapters on the network.

The easiest way to get the adapter address in *NetWare* is to type TRACKON on the server console and then turn on the PC with the remote-boot adapter. The server's screen will show a request coming from a specific adapter looking for a server. Write down the address reported on the server's screen. Once you determine the address of the adapter, you can use the command DOSGEN A:FILENAME.SYS to create a specially named boot-image file. You can give the file any unique name.

Creating a DOS boot image can take some time for the less experienced. But with practice, a network administrator can create a DOS boot image in less than 5 minutes. Using a remote boot image can enhance the flexibility and security of any network of diskless or diskless PCs. ■

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Bob Aumiller, General Automation, Skokie, Illinois



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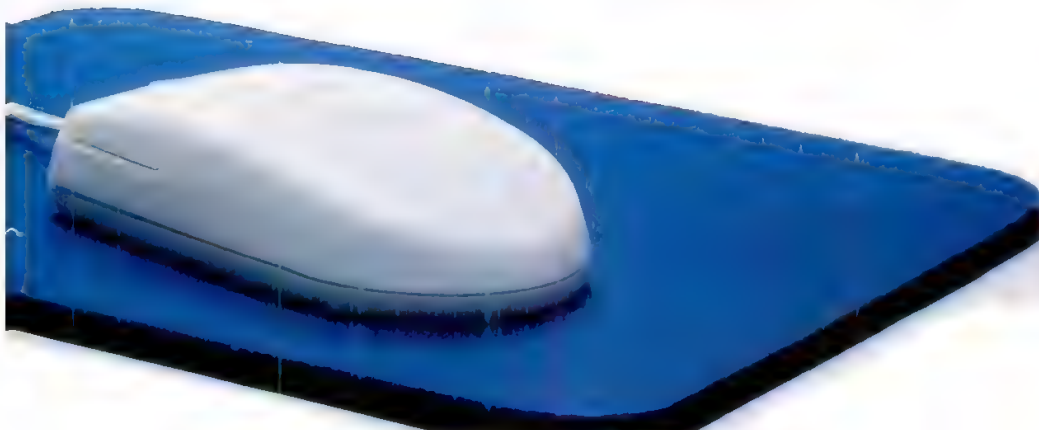
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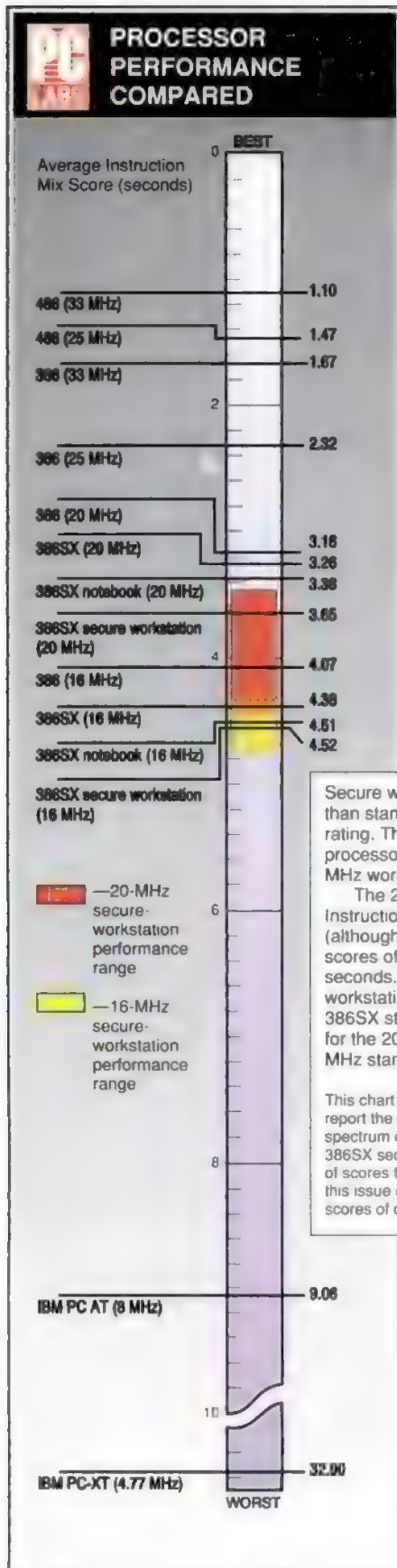


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not always been popular with users because they are not as flexible as standalone PCs and generally make users utterly dependent upon the LAN. But they have become especially attractive options for system managers, who want fewer headaches protecting data and keeping the network virus-free. The product category has also gained new credibility and exposure through the recent introduction of workstations with diskless designs marketed by major players such as IBM (see the sidebar "Locking Up: Austin, Compaq, and IBM Are 'Key' Players in the Secure Workstation Arena").

With few exceptions, the diskless workstations we review here receive boot information from the network file server (see the sidebar "Driving Without a Disk: Booting Up Diskless PCs"), a scheme that can also be used with most of the disk-equipped products in this review. The system administrator creates a special file on the server that supplies CONFIG.SYS, COMMAND.COM, and other DOS files needed to start the workstation. A special ROM chip on the network adapter initiates the action by executing a DOS boot-up

Secure workstations have only slightly slower performance than standalone PCs with the same processor and speed rating. The 20-MHz secure workstations performed our processor test in about 81 percent of the time it took 16-MHz workstations.

The 20-MHz 386SX secure workstations executed the instruction mix benchmark test in 3.43 to 4.44 seconds (although most clustered between 3.43 and 3.50), while the scores of 16-MHz stations ranged from 4.34 to 4.75 seconds. The range of scores for 16-MHz 386SX secure workstations encompasses the average score for 16-MHz 386SX standalone desktops, but even the minimum score for the 20-MHz workstations exceeds the average for 20-MHz standalones.

This chart shows speed differences between processor classes. We report the average instruction mix benchmark test score for the spectrum of desktop systems and for both 16-MHz and 20-MHz 386SX secure workstations. The shaded areas represent the range of scores for 16-MHz and 20-MHz secure workstations reviewed in this issue of *PC Magazine*. This range may overlap with the average scores of one or more categories.

from the file server. After the initial boot, a diskless workstation functions like any normal PC, executing programs in its own CPU and RAM.

REVIEW CRITERIA

The term *diskless workstation* is something of a misnomer. Many "diskless" workstations are actually standalone PCs in standard cases with a floppy disk drive bay and provisions for a controller, but without a floppy disk drive installed. Sys-

tems such as this are available from AT&T Computer Systems, Aten Research, DataBusiness Systems, Falco Data Products, GVC Technologies, IBM Corp., Lancer Research, the LANMaster division of Vestra-Subco, Netcom Research, PC Craft, Samsung Information Systems America, Unitron, Xinetron, and Wyse Technology. Some of these products, which we do not review here, include

With only a few exceptions, the diskless workstations we review here receive boot information from the network file server.

built-in LAN adapters; a number can be purchased directly from the company with or without disks. Unitron and PC Craft make only 286-based diskless systems.

One of the problems with these designs is that they have no way to prevent an end user, either well-meaning or unscrupulous, from simply opening the case and dropping in an inexpensive floppy disk drive and controller. Other than your being able to buy them without a drive, these systems do not have physical features to deter potential security breaches. Certainly, many of them include case or keyboard locks, but that is not an exceptional effort; most standalone systems on the market today include these.

Of course, being truly diskless is not the only way to keep a system safe. Some secure PCs include floppy disk drives or drive bays but also package security features intended to better prevent unauthorized users from accessing the machine.

As a result, we based the selection criteria for this review more on a security perspective than the presence or absence of a floppy disk drive. To qualify, a system had to include a secure method of preventing data from being introduced or removed from the workstation without authorization.

We allowed products whose physical security features ranged from the modest

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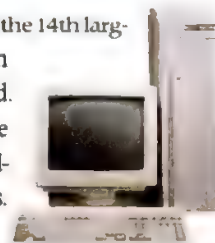
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	386/16	2 to 8MB	3 slots, 3 bays	100W
	386S/20	2 to 32MB	3 slots, 3 bays	100W
PowerMaster	386/25	4 to 8MB	8 slots, 5 bays	250W
	386/33	4 to 32MB	4 slots, 4 bays	200W
SystemMaster	386/33T	4 to 24MB	8 slots, 7 bays	270W
	486/25TE	4 to 32MB	8 slots, 7 bays	300W peak
	486/33TE	4 to 32MB	8 slots, 7 bays	300W peak
NoteMaster	386S/16 (20, 40 & 60MB)	1 to 5MB	Co-processor slot	Standard NiCad

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PLAYING IT SAFE: Security Options for Existing Workstations

by Alfred Poor

Selecting one of the secure workstations we review here is fine if you are setting up a new LAN or adding systems to an established one, but most network administrators must also consider existing installations and ways to make the networked PCs already in place more secure. Others will want to save money by configuring their own secure workstations with off-the-shelf components from the ground up. Fortunately, there are many products available to help with either scenario.

One solution is to use software for security. A range of products exist for this purpose, including programs that provide basic password protection or file encryption, and even software that prevents anyone from using applications not approved for the system. We will cover these products more thoroughly in next issue's feature on computer viruses ("On Guard: 20 Utilities That Battle the Virus Threat"). But many people want more than a software solution.

SIMPLE ANSWER

The simplest solution is configuring a computer with a remote-boot network interface card and no floppy disk drive, and then locking the case to prevent tampering. (In the introduction, we list some of the many computer vendors that will be happy to sell you a bare-bones system without disk drives.) In fact, locking the case is central to many roll-your-own secure-PC approaches, since removing the hardware that provides the security will result in the loss of the protection you meant to provide.

Watch out, though—not all case locks are secure. During roundups of desktop systems at PC Magazine Labs, the reviewers sometimes entertain themselves by seeing how many cases they can open with a single set of keys. The keys and locks provided with many inexpensive systems' cases are not the same as the unique ones provided with each IBM machine, for example. The key from one inexpensive unit will

often unlock dozens of others.

If you want to rely on more than a locked case or need to avoid remote-boot adapters, there are other products to consider. At the simplest level, you can get physical locks for floppy disk drives that look and work much like the locks people once put on rotary phone dials. Secure-It offers floppy disk locks for \$24.95 that fit most 5.25- and 3.5-inch drives (800-451-7592). Another source of locks for floppy disk drives is Anchor Pad International, which makes the \$29.95 DataLock (800-426-2467; in California, 800-626-2467). Anchor Pad also supplies lock systems that prevent someone from walking off with your entire computer.

If you want to boot your workstation locally but do not want the risk of a floppy disk drive, you can use a floppy disk emulator board. Curtis (612-631-9512) offers cards with different capacities and different storage technologies: EPROM, Flash Memory, and static RAM. It even has models that allow you to insert memory modules through a slot in the expansion card mounting bracket, so you can use different "boot disks" as needed. Models range from \$195 to \$995.

SECURITY PLUS CONVENIENCE

Many users want the convenience of a fully configured workstation, however, including floppy disk drives and hard disks. Products exist that can make even these configurations more secure.

As mentioned in the review of Datamedia Corp.'s NETmate/sx20, you can get its Securecard technology in a form that can be added to most ISA-bus computers. Based on the concept of "something known and something owned," this system relies on a combination of a password and an IC (integrated circuit) memory card for each user. The capabilities of the system are sophisticated, controlling access to specific resources in a given workstation based on the rights assigned to each user as stored on the IC card. This allows users to use different



ILLUSTRATION: SHANNON JEFFRIES

workstations, yet gives the network administrator control over what each user can do on any given machine. The product has a list price of \$495; the administration software is \$500.

The Datamedia approach requires that each user be given an IC card, and that each user keep track of that card. If it is lost, a new card must be issued. Harcom Security Systems Corp. (212-766-1802) offers PC-Watchman, a product that takes a slightly different approach. It also relies on the "something known and something owned" technique, but instead of issuing an identification card, Harcom designers rely on something the user is likely to care about and want to track closely.

PC-Watchman uses almost any magnetic-stripe credit card as the user's key to the system. The stripe reader can be mounted internally or externally in the PC and provides a wide range of protection options, including access to individual resources within the PC such as disk drives or I/O ports. The product comes in a variety of configurations ranging from \$275 to \$495. Xtek Electronics, which we examine in the sidebar "Xtek's Secura/386SX: A Wealth of Security Options in a Compact Package," offers a similar product for standalone PCs, the SecureALL card. The SecureALL, available for \$495, can make use of security or credit cards.

If you're looking to make your existing LAN more secure, you need not go to the expense of replacing every machine with one of the systems in the main review. While many of those make fine choices as additions to your network, the options covered here provide a means for you to help seal the leaks in your existing LAN at a reasonable cost. ■

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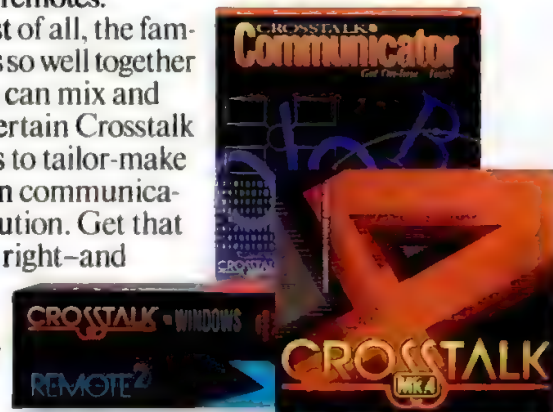
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“Crosstalk Mk.4 ‘does almost everything and does it right.’ ‘Crosstalk Communicator...for the price, it's hard to beat.’ ‘...Crosstalk for Windows is a sure bet.’ —PC Magazine (April, 1991)”

Crosstalk Even Opens Windows.

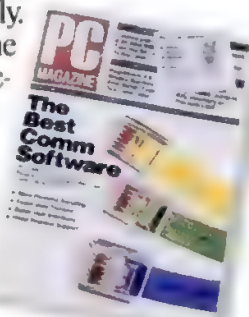
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EDITORS' CHOICE

■ Apricot LS 386SX

The winner in the secure LAN workstation race is the Apricot LS 386SX. This 20-MHz system provides you with both rock-solid security plus flexibility in the physical configuration of the workstation.

Unlike many diskless PCs, whose security lies primarily in their limited expansion and storage options, the Apricot design provides enough space for both a floppy disk drive and hard disk inside. Equally important, the Apricot provides a method of securing data that otherwise could be stolen by means of the very features that provide the sophisticated system with its flexibility.

The Apricot's unique infrared remote control is the key to its secure design. Each PC can be programmed to respond to one or more remote

controls. That's good news for the network administrator, who can assign users different rights on a given machine or group of machines. For example, an administrator can prevent certain users from writing to floppy disks or using a system's I/O ports. Users can blank the screen and lock the keyboard while the PC continues processing. Other security implementations include data encryption and control of users' log-on periods.

Costly? Yes, but the \$3,990 price buys a more secure design than that of some of its equally pricey competition. The package also includes 5MB of RAM, a built-in Ethernet interface, and a Super VGA color monitor. Even better, the system garnered some of the top scores on our Instruction Mix and our Workstation Throughput Evaluation tests.

HONORABLE MENTION

An honorable mention goes to Datamedia Corp.'s NETmate/sx20, a system whose features make it almost as secure as the Apricot. Each user gets a Securecard to provide access; a network administrator might program a user's card so that the user has access to the floppy disk drive on one NETmate, but not on another. Administrators who need to secure existing systems will also appreciate the availability of the Securecard system as a retrofit option.

The NETmate performs somewhat less effectively than the Apricot on the Instruction Mix and Workstation Throughput Evaluation tests but, in general, it provides fine results. The price (\$3,095) is higher than that of a comparable standalone system, but many administrators will find it reasonable when they consider the system's security features.

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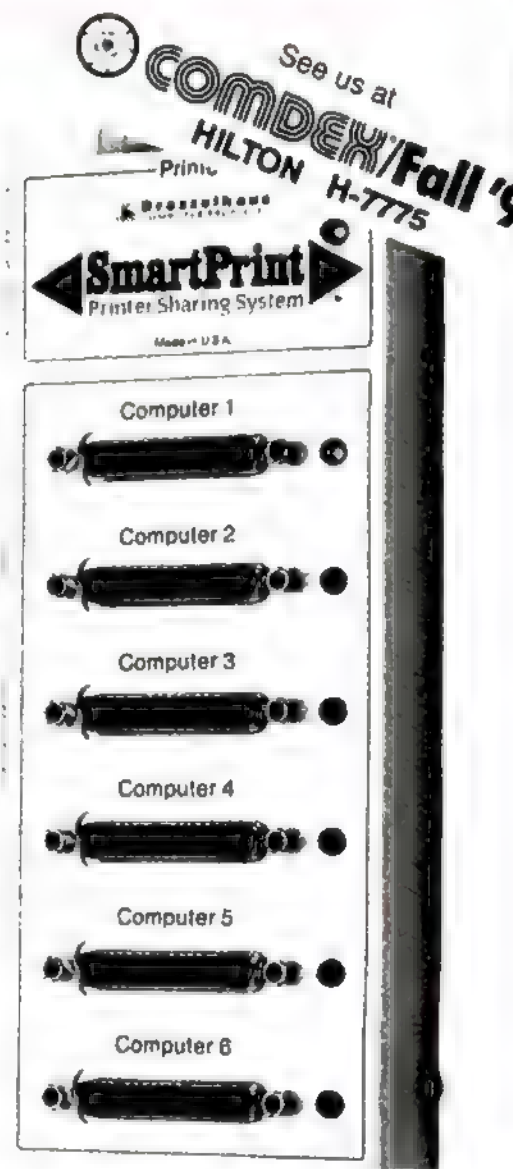
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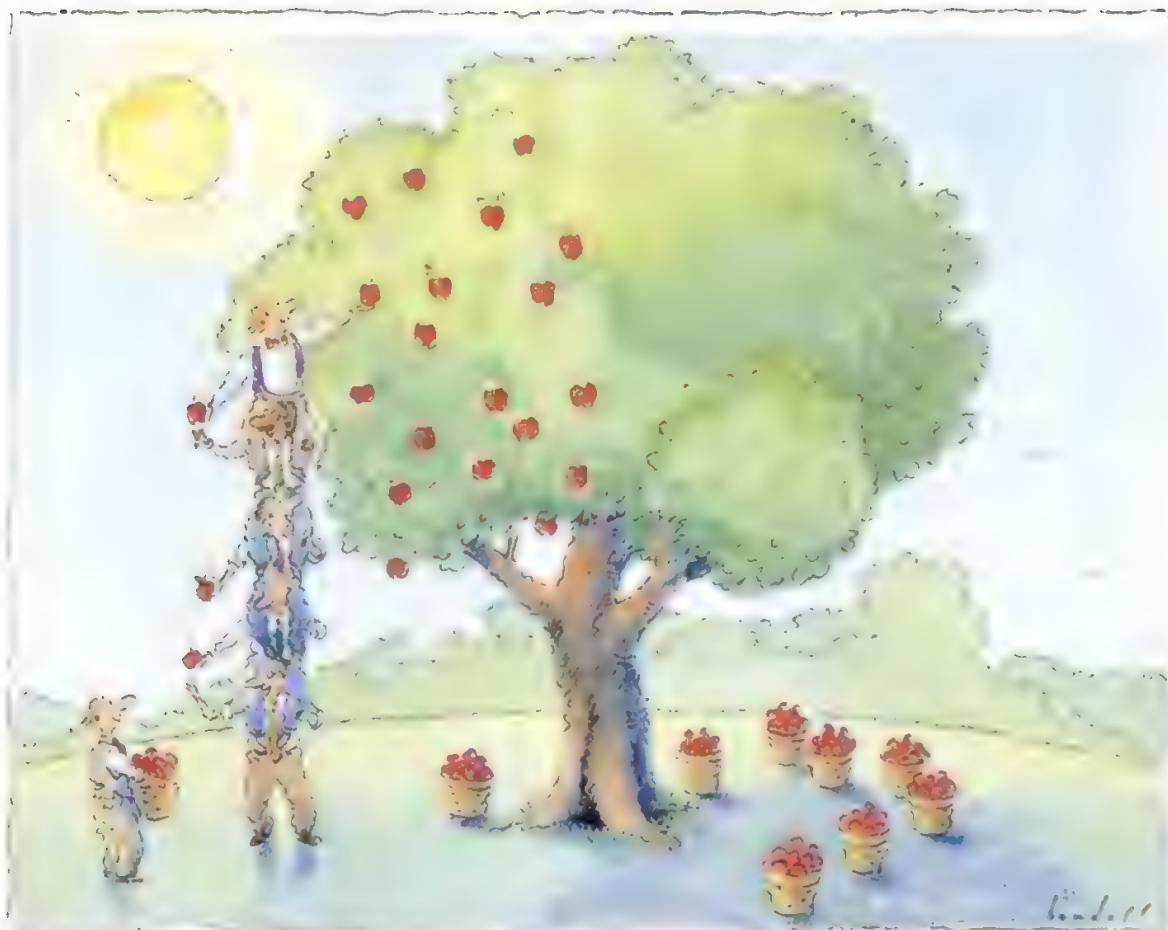
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CONNECTIVITY
SECURE LAN WORKSTATIONS

(American Mitac's MISTation 3S Model MI316S, with a floppy disk drive bay and controller but no drive opening on the case; the TeleVideo TS5 TeleStation with a BIOS that refuses to acknowledge a floppy disk drive; and truly diskless architectures with no floppy disk drive bays or expansion slots for controllers) to more-sophisticated schemes. The latter includes Apricot's infrared remote keys and Datamedia's card keys. (Both the Apricot LS 386SX and Datamedia's NETmate/sx20 include a hard disk and a floppy disk drive.) Your choice of system will depend in great part upon the degree of security you need for your network. Those with very sensitive needs might do better than to choose the MISTation, whose holeless case can be removed by a user intent on attaching a floppy disk drive (of course, using it that way would require leaving the cover off, not the least conspicuous activity). They may even want more than a truly diskless system that sports enough slots to support a controller card for an external floppy disk drive.

To fit our filter, the workstations also had to be based on 80386SX processors, either 16- or 20-MHz. The SX is the CPU

of choice for entry-level business applications. Most of the diskless workstation vendors have settled on this processor as a standard; few offer 386DX options, al-

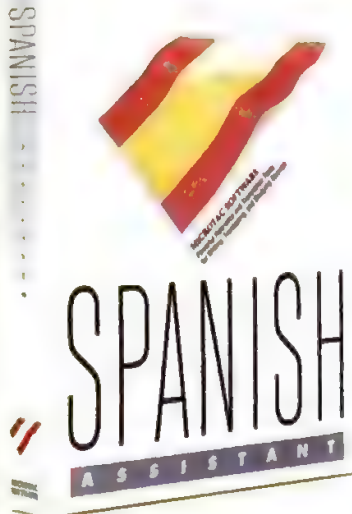
**Being truly diskless
isn't the only way to
keep a system safe;
some PCs are packing
hardware security
features to limit
unauthorized access.**

though some also provide diskless 286 systems. 3Com fit our filter in other respects, but makes only a diskless 286 workstation. The vendor also had to equip its system with 4MB of RAM (we tested

the Apricot LS 386SX with 5MB, which is the only upgrade option from the base 1MB model), and an Ethernet interface. We used the machines on a NetWare LAN.

This set of criteria narrowed the field to ten workstations: Accton's SlimStation SX, Alloy's EarthStation-III, American Mitac's MISTation 3S Model MI316S, the Apricot LS 386SX, Datamedia's NETmate/sx20, Liberty's Network Station Series G, the Republic RPM3/E, the TeleVideo TS5 TeleStation, the Unisys PW² LAN Workstation/386SX, and the U-tron 386SX Purple Diskfree Workstation. Unlike most standalone PC manufacturers, not all these companies offer one-stop shopping; Accton, Alloy, and Republic do not sell monitors for their systems.

One product was not ready in an Ethernet version in time for our testing: Xtek Electronics' Secura/386SX secure workstation. We look at the ARCnet version in a sidebar, "Xtek's Secura/386SX: A Wealth of Security Options in a Compact Package." Datalux is developing a 20-MHz SX-based diskless PC, and Data-Business Systems should be shipping its




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secure workstation in the shape of a PC in a keyboard (not unlike Alloy's EarthStation-III) by the time you read this.

DIVERSE SECURITY NEEDS

The products we reviewed have extremely different appearances. Some look like a typical slimline PC, while others barely resemble a computer; the EarthStation-III is just a keyboard. One result of this diversity is that some models are better suited for certain missions than others.

For example, some incredibly compact models, such as the systems from

**You may pay a premium
 for these units
 compared to standalone
 systems, since you're
 also buying the
 security design.**

Accton, Alloy, Liberty, and Unisys, operate without benefit of a cooling fan. If your desk space is at a premium, or if you find the noise of a fan or hard disk intrusive, one of these machines might suit you. On the other hand, many multiuser applications can benefit from some local disk storage, making the presence of a properly secured hard disk or floppy disk drive in some workstation designs an advantage. Perhaps you have many users who must share a number of machines; a system based on a security card can offer controlled access to machines and give different users different rights on specific workstations. The bottom line is that you need to consider the working and security requirements of your installation carefully.

Because you are purchasing the security design along with these computers, you may pay a premium for these units, compared with similarly configured standalone systems. Datamedia's NET-mate/sx20 with a 100MB hard disk costs \$3,095 in the configuration we tested, while the Apricot LS 386SX that we tested with a 52MB hard disk sells for \$3,990. In comparison, a standalone 20-MHz SX system with a 70MB hard disk and no extraordinary security options goes for

LOCKING UP: Austin, Compaq, and IBM Are "Key" Players in the Secure Workstation Arena

by Alfred Poor

In the main review, you can find LAN workstations whose security is assured by such sophisticated features as card keys and infrared locking devices. There, we also consider systems marked by a permanent inability to recognize a floppy disk drive, by a lack of room to install one internally or the expansion slots to support one externally, or by sealed cases that prevent inconspicuous access when a drive bay is present.

Well-known computer manufacturers such as Austin Computer Systems, Compaq Computer Corp., and IBM Corp. are tackling the secure workstation market from another direction. Their units are suited for a different, less rigorous mission than the one we used as a filter for our reviews. Their systems, generally more flexible, are designed to offer more expansion options than most machines in the main review. With these machines, there is room to install drives; completely sealed cases do not block openings to bays; and the BIOS is not set to ignore a floppy disk drive at all costs. Security is available, but most of it ultimately lies in locks for the physical case and/or the keyboard, much as you could find on any standalone machine.

AUSTIN'S APPROACH

Austin takes a slightly different approach from machines that use a case lock. Its 386/SX NetStation secure workstation is essentially a standard SX standalone system with one added feature. Instead of a regular floppy disk drive, the computer has a special 1.2MB TEAC drive with a physical lock that can be used to prevent a user from either inserting or removing a floppy disk. (Disk locks for existing systems are available from a number of third-party manufacturers; see the sidebar "Playing It Safe: Security Options for Existing Workstations.") The machine also has a keyboard lock, but lacks a case lock. That means someone



Austin 386/SX NetStation

could defeat security by opening the box, swapping floppy disk drives, and quickly closing the box again.

Aside from this feature, the NetStation is a fairly typical slimline 386SX system. It has one parallel and two serial ports, and floppy and IDE hard disk controller ports on the motherboard. A passive riser from the motherboard has three 16-bit ISA expansion slots. The system shipped to *PC Magazine* had 4MB of RAM. The \$2,178 system is available with a \$2,078 VGA monitor kit, but not with a network adapter.

A COMPACT COMPAQ DESIGN

The Compaq Deskpro 386N is a slimline machine with a 1.44MB 3.5-inch floppy disk drive and room for a 3.5-inch hard disk; a 40MB drive is also an option. The back of the case offers parallel, serial, and mouse ports, as well as a connector for a VGA display; all these ports originate on the motherboard. The base \$1,499 model comes with 1MB of memory, expandable to 8MB on the motherboard (or to 16MB with a memory expansion board). The unit does not come with a network interface, but does include two ISA 16-bit expansion slots. A VGA monitor is available for \$699.

The system has some additional protection features, such as using pass-



Compaq Deskpro 386N



IBM PS/2 Model 55 LS

words in ROM for power-on; I/O port control; hotkey combinations to lock the keyboard and mouse; and DIP-switch settings. Through the SETUP program, you can disable system start-up from the floppy disk drive while retaining the ability to read or write to a disk, or disable the drive entirely. You can even set a switch on the system board to disable SETUP control so that users cannot go into SETUP and reenabling the floppy disk drive. But this maneuver ultimately relies on the case lock and the network administrator's ability to make sure that the key to the case is kept in a safe place, so that only authorized users can open the case and enable SETUP control.

IBM GOES DISKLESS

Similarly, the \$2,745 IBM PS/2 Model 55 LS and the newer (just introduced as we went to print) \$2,695 35 LS are both 386SX systems that can be bought diskless. The 55 LS is a 16-MHz machine; the 35 LS is a 20-MHz machine. Both have bays for local hard disks and floppy disk drives, and both have parallel, serial, mouse, and 16-bit VGA ports built into the motherboard. The 55 LS we tested came with 2MB of RAM and a Token-Ring interface, but each system can be purchased with NICs for Ethernet networks. The price includes an IBM VGA monitor.

The 55 LS can accept up to 8MB of RAM on the motherboard; the 35 LS,

which was not available for evaluation in time for this article, can take up to 16MB. One of the biggest differences between the two models, aside from the CPU speed, is the bus architecture: The 55 LS has three 16-bit Micro Channel slots (one with the video extension), while the 35 LS has three 16-bit ISA bus slots. The 35 LS also offers a selectable boot feature, which lets you configure a system to boot from different disk drives; this lets one system conveniently support multiple operating systems.

While both machines come standard in diskless configurations, they can be upgraded to regular standalone systems, similar to IBM's 55 SX and 35 SX models. This upgrade path is a fundamental part of the product design, so the machines have few security features aside from physical locks. The main safeguard against tampering with the system configuration is the case lock that prevents users without the key from removing the cover, but it does not lock the keyboard or otherwise prevent use of the computer.

There is a saying that locks keep only honest people out. Certainly, none of these machines offer security features that would defeat a particularly determined assailant. But if you simply seek a moderate deterrent that goes a bit beyond the standard desktop system, these products do offer a reasonable middle ground. ■

386/SX NetStation

Austin Computer Systems, 10300 Metric Blvd., Austin, TX 78758; 800-752-1577, 512-339-3500.

List Price: \$2,178.

Memory: 4MB 70-ns. SIMMs.

Disk drives and controller: Austin controller, 1.2MB floppy disk drive.

Display: Tseng Laboratories video adapter with 256K video RAM, ViewSonic noninterlaced 14-inch monitor.

Software: DOS 5.0, Microsoft Windows 3.0.

Requires: LAN adapter.

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Compaq Deskpro 386N

Compaq Computer Corp., P.O. Box 692000, Houston, TX 77269; 800-231-0900, 713-370-0670.

List Price: \$1,499; VGA monitor, \$699.

Memory: 1MB 80-ns. SIMMs.

Disk drives and controller: Compaq controller, 1.44MB floppy disk drive.

Display: Compaq VGA adapter with 256K video RAM; Videographics 14-inch monitor.

Requires: LAN adapter.

CIRCLE 650 ON READER SERVICE CARD

IBM PS/2 Model 35 LS

IBM PS/2 Model 55 LS

IBM Corp., 1133 Westchester Ave., White Plains, NY 10604; 800-426-9292.

List Price: \$2,695 (35 LS); \$2,745 for Token-Ring model (55 LS); \$2,395 for Ethernet model (55 LS).

Memory: 2MB 85-ns. SIMMs (35 LS); 2MB 100-ns. SIMMs (55 LS).

Disk drives and controller: IBM controller.

Display: IBM VGA adapter with 256K video RAM, IBM 12-inch monitor.

LAN adapter: IBM 16-bit ISA-bus Token-Ring adapter (35 LS); IBM 16-bit Micro Channel Token-Ring adapter (55 LS).

CIRCLE 651 ON READER SERVICE CARD

XTEK'S SECURA/386SX: A Wealth of Security Options in a Compact Package

by Alfred Poor

Xtek Electronics' Secura/386SX workstation did not have its Ethernet network interface ready in time for testing as part of this review, but if it had, it would likely have been one of the top contenders. The system, which Xtek shipped to us with a proprietary ARCnet board, provides an impressive combination of security features.

The Secura relies on both hardware and software to prevent unauthorized access. Xtek bases its security on the "something owned and something known" strategy. The Secura uses a magnetic-stripe reader that can read data off a standard plastic credit or automated teller machine (ATM) card to provide access. While the unit also comes with specific security cards, the beauty of this design is that user accounts can be set up for any standard credit card. The Xtek Secura/386SX system also lets you define varying levels of access to a system's resources for different users.

You can set up floppy disk drives as read-only, read/write, or not accessible for particular users. The option to set the floppy disk drive as boot-only means that you need not rely on network adapters' remote-boot PROMs. The Secura also offers partition control so different users can boot directly into different operating systems: DOS, OS/2, and Unix or Xenix.

In addition to disk controls, the Secura offers I/O port controls and more. It detects whether the case cover has been removed by an unauthorized user; if it has, the Secura disables the machine, which must then be reset by the system administrator. With an optional encryption board, you can encrypt data stored on local drives. Another feature detects and prevents the introduction of computer viruses.

The Secura/386SX comes with a 16-MHz 386SX processor and a highly integrated motherboard, including two serial and one parallel port, an IDE



hard disk port, SVGA circuitry, and a floppy disk controller. It has three 16-bit expansion slots, one of which is required by the NIC. The base model comes with 2MB of RAM (4MB was included in the test system), plus a 1.44MB 3.5-inch floppy disk drive. With a 40MB hard drive, the system we looked at costs \$2,545. The same machine with a proprietary Ethernet interface, which should be available by the time you read this, will not differ in cost. You can also choose an 80MB or 155MB hard disk. All this fits into a case 16 inches square and 3 inches high.

The Xtek technology is also available as an add-on option for existing workstations. Xtek offers the Secure-ALL system for a cost of \$495.

The entire design of the Secura/386SX is impressive. If you want to buy workstations with top-level security already implemented, and to be able to add similar security to existing workstations, keep Xtek in mind. ■

Secura/386SX

Xtek Electronics Inc., 92 Argonaut, #160, Aliso Viejo, CA 92656; 714-455-4660.

List Price: \$2,545, including two supervisor cards and three user cards; with 2MB, \$2,395. DES encryption board, \$295.

Memory: 4MB 100-ns. SIMMs.

Disk drives and controller: 40MB Microscience IDE hard disk, 1.44MB floppy disk drive.

Display: Cirrus Super VGA video adapter with 256K video RAM.

LAN adapter: Proprietary 16-bit ARCnet adapter with diagnostics.

Requires: Monitor.

CIRCLE 652 ON READER SERVICE CARD

about \$2,500. Some truly diskless systems also incorporate unique designs at higher prices: Alloy's EarthStation-III goes for \$2,790 without a monitor; the 16-MHz Unisys PW² LAN Workstation/386SX, which piggybacks the CPU onto its monitor, costs \$3,425.

Not all the systems we reviewed carry such high price tags, however. The 16-MHz Republic RPM3/E workstation has a low-end price of \$1,673 (albeit without a monitor), while American Mitac's 16-

Anyone thinking about installing secure workstations on their network should also consider the options available to protect existing machines.

MHz MISTation 3S diskless unit costs \$1,995 with a monitor, a price roughly comparable to standalone 16-MHz machines with hard disks.

The higher price of some of these systems does not necessarily guarantee better performance than a standard PC, nor does it promise worse. Our Instruction Mix benchmark test showed that the secure workstations we reviewed lag only slightly behind standalone PCs with the same processor and speed rating.

Anyone thinking about installing secure workstations on their network should also consider the options available to protect their existing machines. For ideas on how to retrofit existing workstations to make them secure, see the sidebar "Playing It Safe: Security Options for Existing Workstations."

REALITY CHECK

Keep in mind that it is practically impossible to make a workstation totally secure by locking it up and still leave it functional enough for the end user. For example, most end users benefit from access to a printer or other output device, but an active parallel or serial port opens the door to data theft. A determined user can introduce new files to a LAN or make un-

CONNECTIVITY
SECURE LAN WORKSTATIONS

authorized copies of existing ones in a number of ways. In addition to external floppy disk drives and tape backup units, a laptop PC with a communications or file-exchange program installed can capture data through a standard I/O port. Consequently, some of the secure PCs reviewed here, such as the Liberty and Republic machines, let you disable or lock the serial port.

No lock can deter every criminal, and none of these workstations can remove all risk from your LAN. But they can make your systems—and therefore, your network—significantly safer. If security is a top priority for your LAN, you will find these machines worth investigating.

All reviews by Alfred Poor

ACCTON TECHNOLOGY CORP.
SlimStation SX



The SlimStation SX from Accton.

How thin can a desktop computer get? The SlimStation SX from Accton Technology lives up to its name, rising a scant 2 inches high. At that size, it might be in danger of getting lost in the snowdrift of papers that covers some desks. But with a list price of \$1,495 for the base model with a 16-MHz 386SX and 1MB of memory, it's worth a careful look. Our test configuration came with an additional 3MB of memory, bringing the total price to \$1,835. Accton does not supply a monitor with the unit, but the price does include built-in Super VGA circuitry.

The front of the case contains a single switch that doubles as a power-on and hardware-reset switch. It has no power-off button; the machine is designed to be

left on all the time, although a keyboard combination can power down the system when necessary.

The simple interior design favors full-time operation. A custom motherboard at the base of the case leaves ample room for components. The power supply is a separate unit, slightly larger than the average laptop brick. As a result, the system does

not generate too much heat, so the SlimStation SX can be left on all the time, even though it does not have an internal fan.

CARD CONNECTIONS

A modified expansion board provides the Ethernet connection. Instead of using its ISA-bus edge connector, the proprietary daughtercard attaches to the motherboard's 16-bit bus with a double row of pins. Connections on the back of



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PC Magazine, 12/11/90 (Ziff-Davis Publishing) "9600-BPS MODEMS. Breaking the Speed Barrier-PC LAN Labs tests seven rapid-fire modems complying with V.32, V.42 and V.42bis standards."

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FACT FILE

SlimStation SX

Accton Technology Corp., 46750 Fremont Blvd., Bldg. 104, Fremont, CA 94538; 800-926-9288, 415-226-9800.

List price (tested configuration): \$1,835.

Memory: 4MB 80-ns. SIMMs.

Display: Oak Technologies Super VGA adapter with 256K video RAM.

LAN adapter: Proprietary 16-bit Ethernet interface.

Requires: Monitor.

CIRCLE 639 ON READER SERVICE CARD

the case allow for either AUI or coaxial connections. You cannot disable the Ethernet connection, and there are no alternative topologies currently available.

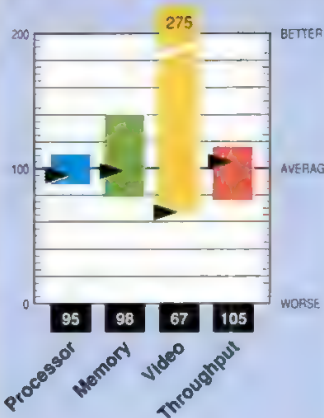
Like most of the diskless models we reviewed, the system has an Ethernet interface that relies on the presence of a remote-boot ROM. Installing it on a

NetWare LAN is straightforward if you are familiar with remote-boot operations.

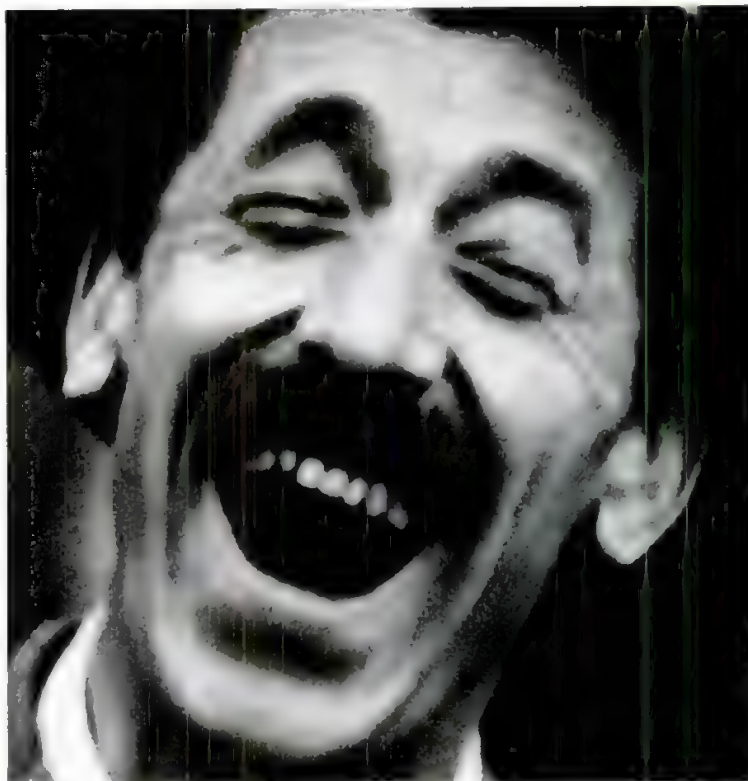
The back includes connectors for two serial ports and a parallel port. A 15-pin connector provides a Super VGA signal based on an Oak Technologies video chip set interface integrated on the motherboard. The system comes with 800- by 600-resolution drivers for a variety of

programs, including *Microsoft Windows*, *AutoCAD*, and *Ventura Publisher*. Since the machine has no disk, the drivers are installed on the server.

The SlimStation SX uses an AMI BIOS that includes a setup utility in ROM. You can access the utility during a reset, making it fairly easy to configure your system. One drawback of the system is that it cannot be configured with more than 4MB of memory.

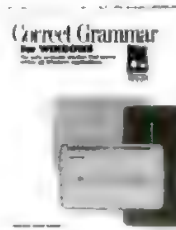
Accton SlimStation SX**► TEST RESULTS**

In Short: Accton Technology Corp.'s 16-MHz SlimStation SX has a reasonable price and performed better on our throughput test than some 20-MHz units. Its slow video time is something of a drawback, but in many ways it is an attractive system. It has a minimalist desktop design, with just a motherboard and a network adapter daughtercard in its 2-inch-thin case. It has no internal fan, and the power supply resides outside the system. Its security primarily lies in the fact that it lacks a floppy disk drive.



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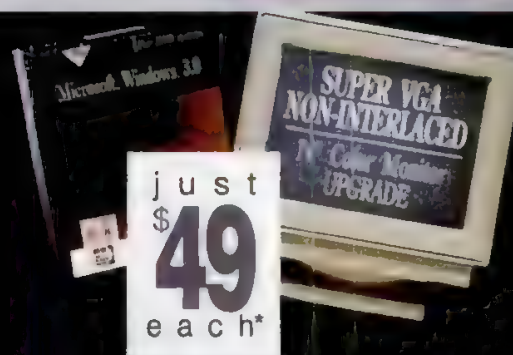
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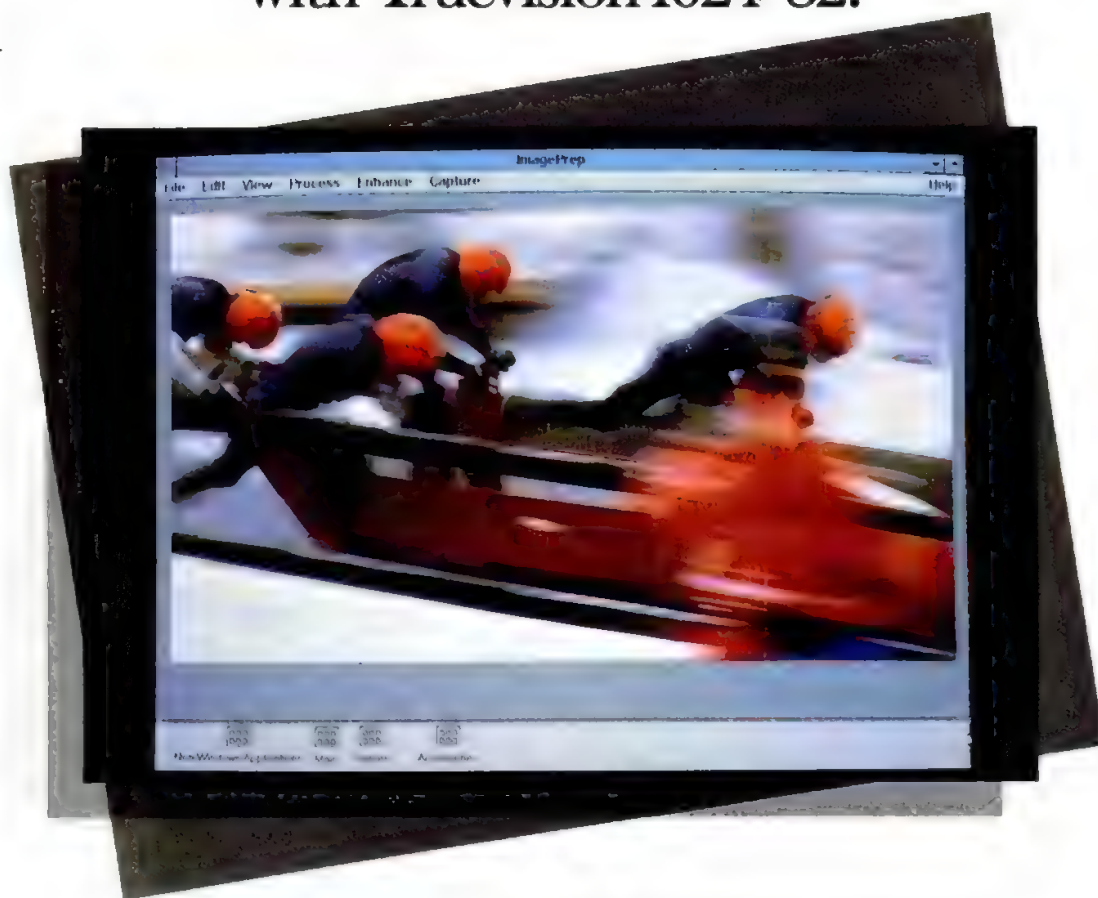
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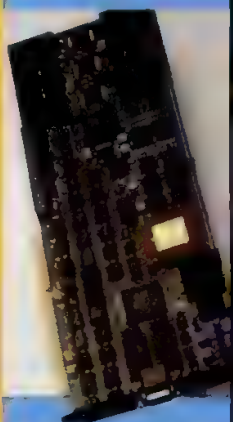
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CONNECTIVITY
SECURE LAN WORKSTATIONS

About the only poor aspect of the Accton unit is its minimal documentation. Typeset in a much-reduced Courier typeface, the manual presents most of the necessary information but is not as clearly written or thorough as some users might like or need.

Free technical support is available at a toll number from 7:30 to 5:00 P.S.T.

386SX PERFORMANCE

The computer performs about as expected for a 16-MHz 386SX. Its videotimes were slow, but the Workstation Throughput Evaluation test results were better than some of the 20-MHz units' numbers. (Accton's diskless 20-MHz SX system should also be shipping by the time you read this.)

The security of the Accton SlimStation SX lies in the fact that the system is truly diskless (there is no room for a floppy disk drive in the case) and that it requires you to boot off the network. From that point, you must rely on the network security to control the operator's access to your company's information.

It's a pretty safe bet, however, that most users will not be able to use this workstation to add or remove information from your local area network. The SlimStation SX provides a straightforward design at a reasonable price.

ALLOY COMPUTER PRODUCTS INC. EarthStation-III



The EarthStation-III from Alloy.

You might wonder about a product with a name as spaced-out as EarthStation-III, and no doubt about it, this system is unusual. It's reminiscent of the scene from the movie *A View to a Kill* where James Bond is driving around in just the front

half of a car; you'll take one look at this keyboard and wonder where the rest of the computer went.

The answer is that the entire computer is inside the keyboard housing. For a list price of \$1,890, Alloy Computer Products will sell you a base model system that comes with a 16-MHz 386SX CPU, 1MB of memory, VGA support, and an

About the only poor aspect of the Accton unit is its minimal documentation.



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1-800-227-0847

2215 Filbert Street, San Francisco, CA 94123
Phone: (415) 563-9175 Fax: (415) 563-0836

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Unfortunately, everyone working with your company's data may not be working with your company.

An unsecured PC is an open invitation to trouble. A competitor could steal your most sensitive information. Or a well-meaning employee could accidentally alter or delete important data or leave a virus behind. That's why you need DiskLock.™

DiskLock doesn't let anyone into your system without entering your password. It automatically locks your drive when you turn off your computer, and you can set it to lock when your PC has been idle for a time you've specified.

And when it locks, it locks. DiskLock lets

you choose from three levels of security, including the government standard, DES encryption. That's serious protection.

DiskLock works transparently, so you can work without interruption. You can lock only your drive, or you can lock your drive and individual directories or files. And it automatically records unsuccessful entry attempts.

You won't find better protection for your sensitive data.

To find out more about DiskLock, call 1-800-677-1848. Buy DiskLock now
CIRCLE 236 ON READER SERVICE CARD

and get a free locking diskette box. Just write "lock box" on the registration card and return it. This is a limited-time offer, so secure one today.

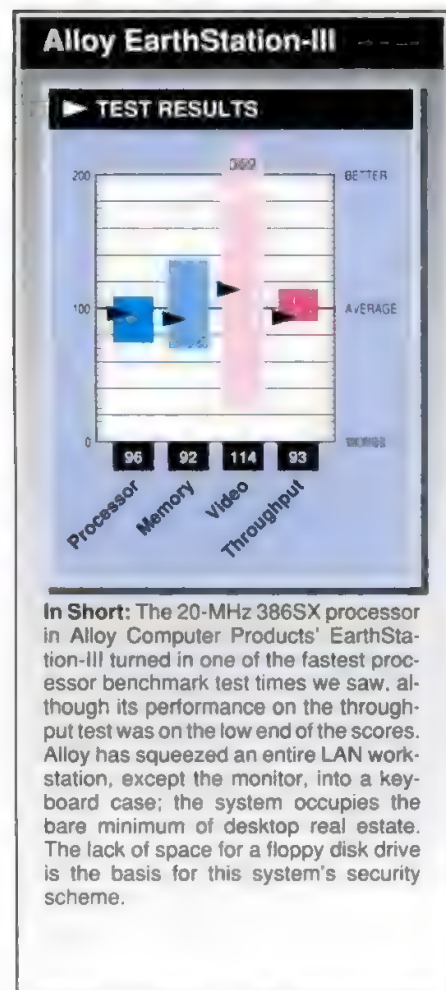


Fifth Generation Systems, Inc.
10049 N. Reiger Road, Baton Rouge, LA 70809
Technical Support: (504) 291-7283

The design of Alloy's EarthStation-III is clearly unique. It looks much like a standard keyboard, but in fact, a 20-Mhz 386SX computer is inside the keyboard housing.

ARCnet interface.

The version that we tested had a 20-MHz 386SX with 4MB of memory, Super VGA display adapter circuitry, and a proprietary Ethernet daughtercard, all for a list price of \$2,790. Alloy's EarthStation-III system is also available in a Token-



CONNECTIVITY SECURE LAN WORKSTATIONS

Ring model. The company does not supply a monitor with any of the EarthStation units.

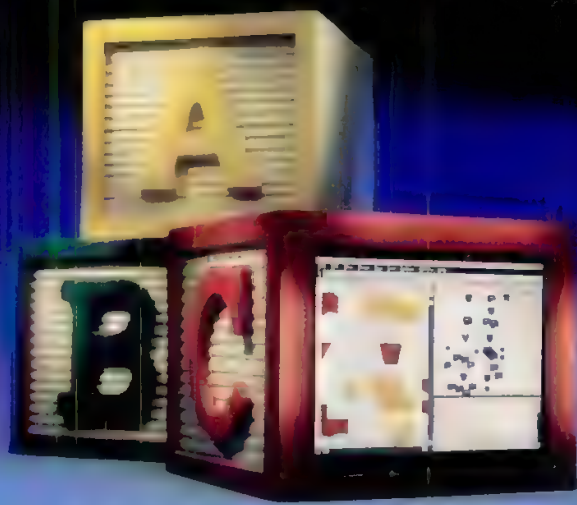
UNIQUE DESIGN

The design of this system is clearly unique. A look along the back edge of the keyboard will give you an indication of the contents of the case.

You get one parallel and two serial ports, plus connectors for Ethernet AUI, coaxial, and twisted-pair cabling. The unit includes two video connectors, a 9-pin digital and a 15-pin analog connector, and an AC power cord.

All the space inside the case has been put to good use. Power-supply components sit in the back-right corner and the custom motherboard covers the base. Special connectors on the motherboard

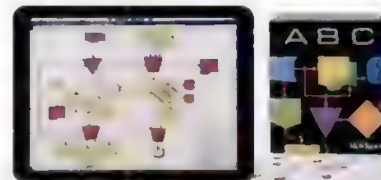
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Phone: (415) 563-9175 Fax: (415) 563-0836

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SECURE LAN WORKSTATIONS: A DETAILED LOOK AT THE SYSTEMS

The diagrams on this page and the following page illustrate the various designs implemented by the secure LAN workstations in this review. The spectrum of styles includes everything from Accton's version of the standard pizza-box design to Alloy's PC-in-a-keyboard. They range from the computer built into the base of Liberty's black-and-white monitor to the Unisys PW² LAN Workstation/386SX, with its CPU encased inside a 2-inch-thick module clinging to the back of the monitor. The Apricot LS 386SX has an innovative design that relies on an infrared remote control for user access. Datamedia's NETmate/sx20 provides a secure card-key slot to prevent unauthorized access.

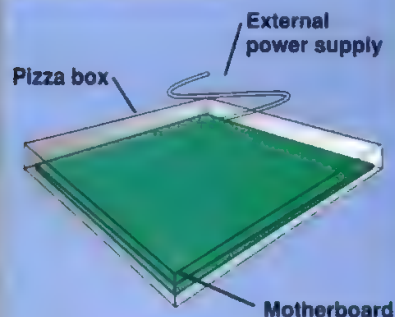
The interiors of these specially designed systems also separate them from most

standard PCs on the market today. For instance, security concerns dictate that you will find few, if any, expansion slots or drive bays inside most of the systems reviewed here; the power supply sometimes exists outside of the case, resulting in machines that do not generate much heat, even without an internal fan. Further, Ethernet interfaces are built directly into the units' motherboards in some cases. The Apricot boasts an interesting internal design: Loosen two screws to slip the case cover off and the clamshell chassis flips up to reveal the system interior. The floppy disk drive, which is accessible from the side, is mounted on the flip-top cover; the hard disk resides on the right-hand side of the machine.

Accton SlimStation SX

Dimensions

Height: 2"
Width: 14.2"
Depth: 11.7"



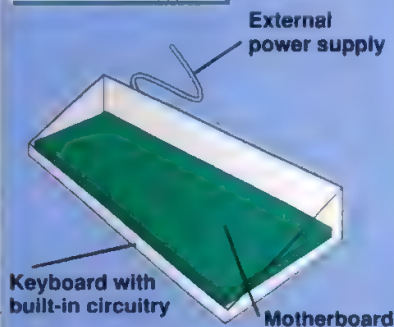
BACK PANEL



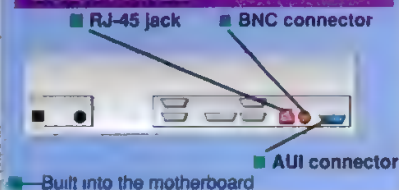
Alloy EarthStation-III

Dimensions

Height: 2.7"
Width: 19"
Depth: 8"



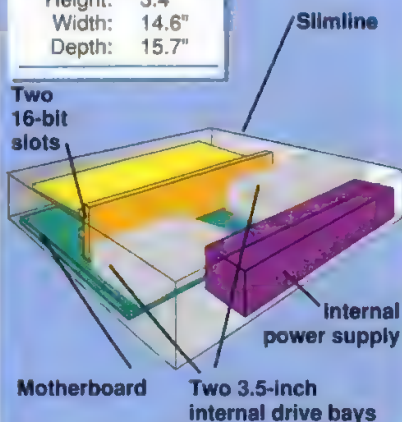
BACK PANEL



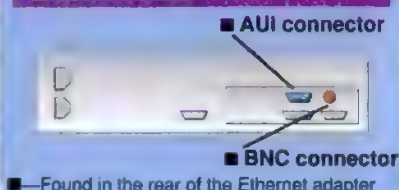
American Mitac MiStation 3S Model M3160

Dimensions

Height: 3.4"
Width: 14.6"
Depth: 15.7"



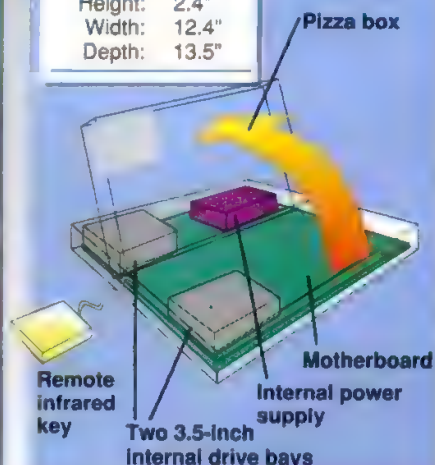
BACK PANEL



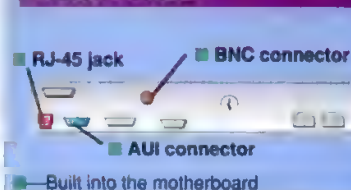
Apricot LS 386SX

Dimensions

Height: 2.4"
Width: 12.4"
Depth: 13.5"



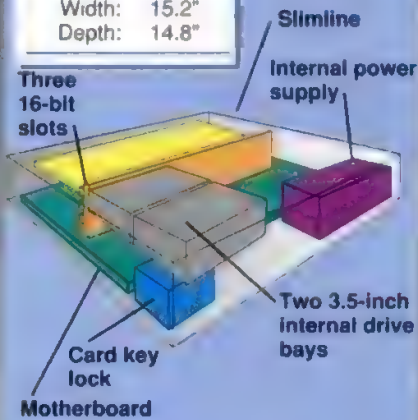
BACK PANEL



Datamedia NETmate/sx20

Dimensions

Height: 4.5"
Width: 15.2"
Depth: 14.8"



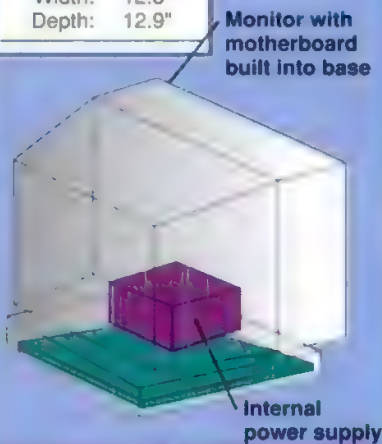
BACK PANEL



Liberty Network Station Series G

Dimensions

Height: 13.6"
Width: 12.8"
Depth: 12.9"



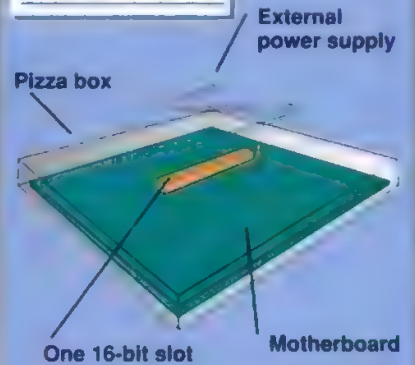
BACK PANEL



Republic RPM3/E

Dimensions

Height: 2.5"
Width: 12"
Depth: 12.5"



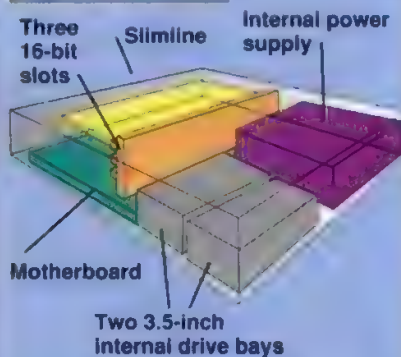
BACK PANEL



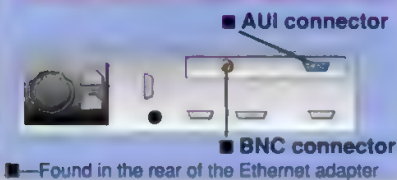
TeleVideo TS5 TeleStation

Dimensions

Height: 4"
Width: 14"
Depth: 15.7"



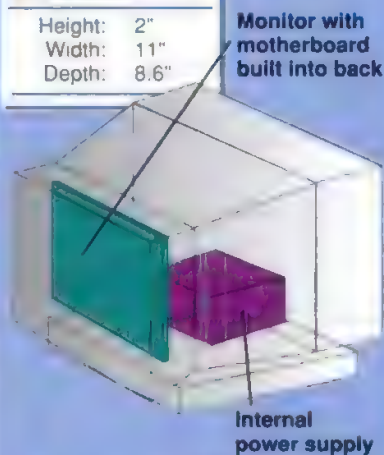
BACK PANEL



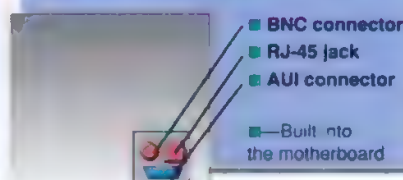
Unisys PW² LAN Workstation/386SX

Dimensions

Height: 2"
Width: 11"
Depth: 8.6"



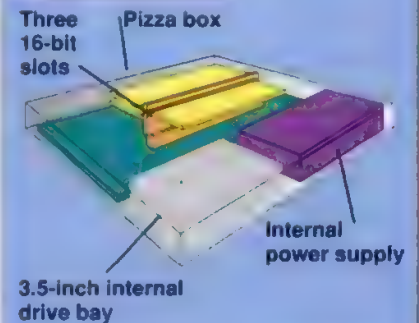
BACK PANEL



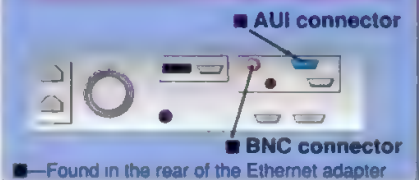
U-tron 386SX Purple Diskfree Workstation

Dimensions

Height: 3.2"
Width: 16.1"
Depth: 15"



BACK PANEL



CONNECTIVITY

SECURE LAN WORKSTATIONS

List price (tested configuration) For this review of 16- and 20-MHz 386SX secure workstations, we requested a standard configuration that included 4MB of RAM, an Ethernet interface, a VGA or Super VGA video adapter, and at least one serial and one parallel port. (Apricot provided 5MB of RAM, as its system upgrades only from 1 MB to 5MB.) When possible, we asked the companies to provide either color or black-and-white VGA or Super VGA displays (not all companies can supply monitors to end users). Although most of the products are diskless PCs, we asked the companies that did plan to send hard disks to provide us with disks of a 50MB to 100MB capacity. All ten PCs reviewed here provide a reasonably close match to this list of requirements.

Distribution channel Dealers often offer discounts of 25 percent or more off the list price (although there is no guarantee that the discounts will run this high). Direct mail-order vendors offer no such discounts.

80386SX chip set manufacturer indicates which company makes the support logic that connects the CPU with the other functions managed by the system board. In some cases the computer uses discrete logic rather than a chip set.

System RAM arrangement refers to the method in which memory is addressed. Different arrangements aim at avoiding the wait states imposed when CPU speed outpaces conventional memory speed.

Page-mode architecture allows back-to-back memory accesses within banks of RAM defined as pages.

Interleaved RAM arrangement divides memory into two or four portions that process information alternately. The CPU sends information to one section for processing while another section undergoes a refresh cycle.

Systems may also use interleaving in conjunction with page-mode architecture. We refer to this arrangement as *interleaved page*.

Installable RAM indicates the minimum and maximum amount of memory that can be installed using any combination of chips and proprietary cards.

The **BIOS version** can affect PC Magazine Labs' benchmark test results. Those purchasing the same machine with a different BIOS version may encounter some variations in performance.

Shadowing is the use of shadow RAM, a technology that directly loads video BIOS or system BIOS into fast RAM on boot-up of the computer, thereby accelerating performance. It uses a segment of system memory located between the boundary of conventional memory (640K) and the end of the first megabyte of installed RAM. With some applications, the ability to disable shadowing is important in resolving memory conflicts.

Expansion slots We report the total number of slots on the motherboard and the number of slots left open when the PC is equipped in our tested configuration, including a network interface.

Display mode refers to the resolution of the video card that comes in the tested configuration.

The **display circuitry location** can be on an expansion card or on the motherboard. Motherboard circuitry is often faster, but if it cannot be disabled there is no way to upgrade it.

hold the 8-bit network-interface daughter-card and the integrated video adapter circuitry.

The EarthStation-III has no fan or external power supply. The area under the internal power supply runs quite hot; you would not want to operate this machine on your lap with bare legs for any length of time.

UNUSUAL DRIVE MAPPINGS

Setup and operation are straightforward. The EarthStation-III has the requisite ROM to enable remote booting off a network file server.

The only unusual detail is that the EarthStation unit remaps the network drive to drive A:. Your drive mappings may not match unless they are explicitly set for all workstations in the log-on scripts stored

FACT FILE

EarthStation-III
 Alloy Computer Products Inc., 165 Forest St.,
 Marlborough, MA 01752; 800-544-7551, 508-
 481-8500.

List price (tested configuration): \$2,790.
Memory: 4MB 80-ns. SIMMs.
Display: Chips and Technologies' Super VGA
 adapter with 512K video RAM.
LAN adapter: Proprietary 8-bit Ethernet
 interface.
Requires: Monitor.

CIRCLE 640 ON READER SERVICE CARD

on the server.

Alloy provides good, attractively designed documentation for the EarthStation; it includes plenty of illustrations and lucid explanations, along with a good deal



SUMMARY OF FEATURES: SECURE LAN WORKSTATIONS

Products listed in alphabetical order by company

	Accton SlimStation SX	Alloy EarthStation-III	American Mitac MStation 3S Model MI316S
List price (tested configuration)	\$1,835	\$2,790	\$1,995
Distribution channel	Dealers	Dealers, direct	Dealers
Bus architecture	ISA	N/A	ISA
Case type	Pizza box	Keyboard only	Slimline
Dimensions (HWD, in inches)	2 x 14.2 x 11.7	2.7 x 19 x 8	3.4 x 14.6 x 15.7
80386SX chip set manufacturer	Intel	C&T	C&T
System RAM arrangement	Interleaved	Interleaved page	Interleaved
Processor speed	16 MHz	20 MHz	16 MHz
MEMORY AND BIOS			
Installable RAM	1MB-4MB	1MB-8MB	1MB-8MB
BIOS version and date	AMI DISX-1198 (4/9/90)	CHIPS NEATsx 1.2.0 (12/3/90)	Phoenix 3.10.00 (1/15/88)
System shadowing/Video shadowing	■ ■	■ ■	■ / ■
DISK DRIVES			
Drive bays	None	None	Two 3.5-inch
Controller integrated on motherboard	N/A	N/A	■
EXPANSION SLOTS			
Slot size	N/A	N/A	Two 16-bit
Slots free with network interface installed	N/A	N/A	1
Ports originate on motherboard	■	■	■
Dedicated mouse port	□	□	■
VIDEO			
Display mode	Super VGA	Super VGA	Super VGA
Display circuitry location	Motherboard	Motherboard	Motherboard
Video adapter manufacturer	Oak	Alloy	Mitac
Video chip set manufacturer	Oak	C&T	Western Digital
ETHERNET INTERFACE			
Interface location	Proprietary daughterboard	Proprietary daughterboard	Card

— Editors' Choice

■ — Yes

□ — No

N/A — Not applicable: The product does not have this feature. C&T—Chips and Technologies Inc.

CONNECTIVITY SECURE LAN WORKSTATIONS

of technical detail on the system's ROM-based setup utility and network cabling considerations.

The system is based on Chips and Technologies' system chip set and BIOS, and the 20-MHz processor turned in some of the fastest processor times in the field. Its results on the Workstation Throughput Evaluation test were less impressive, however.

Alloy provides technical support at a 900 number to end users from 9:00 to 5:00 E.S.T.

The main attraction of the EarthStation-III is its size; its footprint is no larger than a keyboard's. As with many diskless PCs, security lies in preventing you from installing a floppy disk drive; you must rely on the network operating system for access.

If you are looking for a LAN workstation that takes up the minimum amount of

space, the EarthStation-III is one system worth considering.

AMERICAN MITAC CORP.

MIStation 3S Model MI316S

The MIStation 3S Model MI316S from American Mitac Corp. is one of the most conventional entries in this group, as it looks much like most low-profile desktop systems. The big difference is that though there are drive bays, there are no holes in the front panel to accept a floppy disk drive.

Along with the low profile comes a low price. The base unit with a 16-MHz 386SX and 1MB of RAM lists for \$995,



American Mitac's MIStation 3S.

and our test unit with 4MB costs \$1,995. That price includes a Mitac Super VGA color monitor, built-in Super VGA circuitry, and a 16-bit CNet Ethernet adapter

Apricot LS 386SX	Datamedia NETmate/sx20	Liberty Network Station Series G	Republic RPM3/E	TeleVideo T55 TeleStation	Unisys PW LAN Workstation/386SX	U-tron 386SX Purple Diskfree Workstation
\$3,990 Dealers, direct N/A Slimline	\$3,095 Dealers, direct ISA Slimline	\$1,788 Dealers ISA Enlarged monitor base	\$1,435 Dealers, direct ISA Pizza box	\$2,727 Dealers, direct ISA Slimline	\$3,425 Direct N/A Piggyback (fits onto monitor)	\$2,335 Dealers, direct ISA Pizza box
2.4 x 12.4 x 13.5 C&T Interleaved page 20 MHz	4.5 x 15.2 x 14.8 Intel Interleaved page 20 MHz	13.6 x 12.8 x 12.9 ACC Interleaved page 20 MHz	2.5 x 12 x 12.5 Intel Page 16 MHz	4 x 14 x 15.7 Intel Interleaved 16 MHz	2 x 11 x 8.6 Intel Interleaved 16 MHz	3.2 x 16.1 x 15 Intel Interleaved page 20 MHz
1MB-8MB Phoenix 3.10.05 (1/15/88), Apricot 1.02.19 (1/3/91) ■/■	2MB-32MB DMC 1.0 (11/21/90) ■/■	1MB-16MB Quadtel 3.05.03 (2/1/91) ■/■	1MB-8MB Republic 3.10.11 (05/20/91) ■/■	1MB-16MB TeleStation5 A2 (09/24/90) ■/■	1MB-8MB Phoenix 1.10.00 (01/15/88) ■/■	512K-8MB Award Topcat 3.10 (11/22/89) ■/■
One 3.5-inch ■	One 3.5-inch ■	None N/A	None N/A	None N/A	None N/A	One 3.5-inch □
N/A N/A ■ ■	Three 16-bit 2 ■ ■	One 16-bit 1 ■ □	One 16-bit 1 ■ □	Three 16-bit 2 ■ □	N/A N/A ■ ■	Three 16-bit None □ ■
Super VGA Motherboard Apricot C&T	Super VGA Motherboard Datamedia Tseng	VGA Motherboard Liberty Tseng	Super VGA Motherboard Republic Trident	VGA Motherboard TeleVideo Paradise	VGA Motherboard Unisys Western Digital	Super VGA Card Headland Headland
Motherboard	Card	Motherboard	Motherboard	Card	Motherboard	Card

CONTINUES

THE MOST USE TO COME ALONG



A few months ago we brought you the world's most useful computer—the Toshiba T2000SX.

That computer symbolized what we call "the next generation in personal computing." A com-

puter that not only allows you the freedom to work where, when, and how you want to. But is so precisely engineered—from its superior keyboard to its easy-to-read VGA screen—

that you'll actually enjoy using it.

Well, thanks to the incredible speed of modern technology, here we are once again.

This time to present the new Toshiba T2000SXe.

FULL COMPUTER SINCE FEBRUARY.

THE E STANDS FOR EXTRA POWER.

Like the T2000SX, the T2000SXe weighs a minuscule 6.9 pounds, it boasts a 386SX processor, and it supplies up to 60 MB of hard disk storage space. But, and here's the news, the T2000SXe gives you a bigger dose of speed (20MHz) and more memory (2-10 MB RAM).

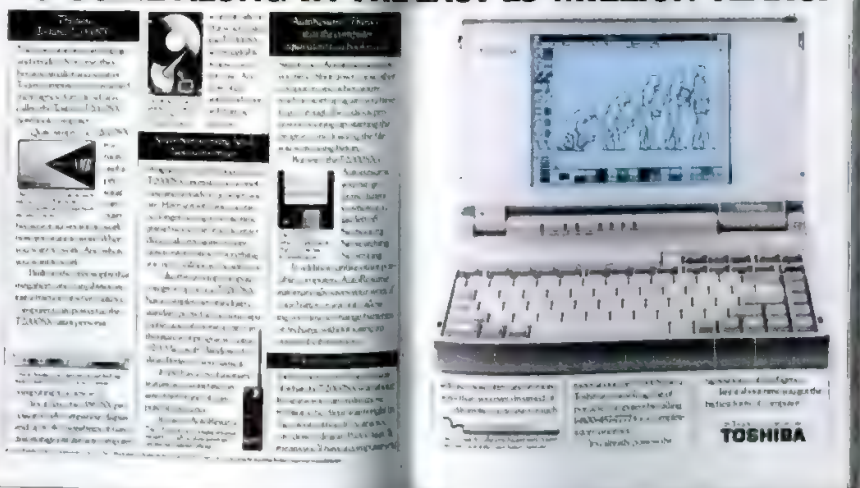
Of course, the T2000SXe also offers Hypertext, a VGA screen, full modem capabilities (including available cellular and fax accessories), full-size sculpted keys on its keyboard and a host of additional benefits that make other notebooks look more like memo pads.

A LONGER LASTING BATTERY.

The most useful computer isn't of much use if its battery doesn't last long.

That's why the T2000SXe, like the T2000SX, is armed with a Nickel Hydride battery. Nickel Hydride is proven to deliver 22% more power per ounce than the NiCad batteries found in other portable computers. In fact, according to Byte magazine, the battery on Toshiba's T2000SX lasted well over three hours on a 90-minute charge. Outlasting

INTRODUCING THE MOST USEFUL COMPUTER TO COME ALONG IN THE LAST 15 MILLION YEARS.



After testing eight of the top notebook computers on the market, Byte Magazine said, "Buy the Toshiba T2000SX." Wait'll they try the T2000SXe.

every other notebook they tested and lasting twice as long as some.

To get even greater battery life, the T2000SXe offers Toshiba's highly acclaimed AutoResume. A special feature that allows you to shut your computer down and start up precisely where you left off. Without the hassle of rebooting, restarting applications and reloading files.

NOW THERE ARE EVEN MORE CHOICES.

At Toshiba, we've always believed that no one computer is right for everyone. That's why we've also

added a more affordable notebook to our line called the T2000. Featuring a 12MHz, 286 processor, it's designed for people who don't need all the power of the T2000SX or the T2000SXe.

If you'd like to learn more about the world's most useful notebook and portable computers, please call us at 1-800-457-7777.

Well, that's the latest. Three incredible notebooks that fit your needs, your briefcase and now your budget.

Isn't technology wonderful?

In Touch with Tomorrow
TOSHIBA

CONNECTIVITY

SECURE LAN WORKSTATIONS

American Mitac offers one of the more conventional entries in this group, as it looks much like most low-profile desktop systems.

with two 16-bit slots. One slot is required for the network adapter, but the other remains available for extra expansion cards, such as CD-ROM or scanner interfaces.

The motherboard contains the rest of the I/O and feature connectors, including serial, parallel, and mouse ports, plus a Super VGA adapter that is based on a Western Digital video chip set. You can get images with up to 1,024-by-768 resolution; the system comes with drivers for popular applications, including *Microsoft Windows*, *AutoCAD*, *Lotus 1-2-3*, and *WordPerfect*.

DRIVE BAYS INSIDE

Two bays in the system can hold 3.5-inch devices, and the motherboard includes floppy and hard disk (IDE) ports. Although you cannot reasonably make use



FACT FILE

MiStation 3S Model MI316S

American Mitac Corp., 410 E. Plumeria Dr., San Jose, CA 95134; 800-648-2287, 408-432-1160.

List price (tested configuration): \$1,995.

Memory: 4MB 80-ns. SIMMs.

Display: Western Digital Super VGA adapter with 256K video RAM, Mitac 14-inch monitor.

LAN adapter: C Net 16-bit Ethernet interface.

CIRCLE 641 ON READER SERVICE CARD

with remote-boot ROM.

Inside the case, you'll find a Mitac motherboard engineered for a compact system. In the middle of the board is a single 16-bit ISA expansion slot, from which rises a passive extension board

of a floppy disk drive without removing or cutting the front panel of the case, it is relatively easy to install a hard disk. The motherboard only supports one hard disk, however, so unless you resort to a separate controller, you will not be able to make use of the second drive bay.

SUMMARY OF FEATURES: SECURE LAN WORKSTATIONS

Products listed in alphabetical order by company

	Accton SlimStation SX	Alloy EarthStation-III	American Mitac MiStation 3S Model MI316S	Apricot LS 396SX	Datamedia NETmate/sx20
ETHERNET INTERFACE (continued)					
Boot PROM chip	■	■	■	■	■
Interface can be disabled	■	■	┘	■	┘
Interface supports:					
AUI (attachment unit interface)	■	■	■	Optional	■
Thick and thin coaxial	■	■	■	■	■
Unshielded twisted-pair	□	■	┘	Optional	Optional
COMPATIBILITY					
LAN Manager	┘	□	┘	■	■
NetWare (2.x and 3.x)	■	■	■	■	■
VINES	□	┘	┘	■	■
BUILT-IN SECURITY					
BIOS-level security (set-up password in ROM)	□	□	■	■	■
Specialized access key	□	□	□	■ (infrared remote)	■ (card key)
Keyboard/case lock	□/□	□/□	□/□	□ ■	□/□
Internal password for drives, keyboard, monitor	□	□	■	■	■
Antivirus checking	□	□	□	□	□
Data encryption	□	□	□	■	□
I/O ports lockable at hardware level	□	□	□	■	■
MISCELLANEOUS					
Keyboard manufacturer	Chicony	Alloy/Fujitsu	Chicony	Apricot	Key Tronic
Power supply:					
Wattage	30	32	60	35	145
Dimensions (HWD, in inches)	5.7 x 3.3 x 2.5	3.8 x 2.7 x 3.6	Internal	Internal	Internal
Fan	None	None	Internal	Internal	Internal
Warranty	1 year	1 year	1 year (on-site)	1 year	1 year

■ — Editors' Choice

■ — Yes

□ — No

N/A — Not applicable: The product does not have this feature.

CONNECTIVITY

SECURE LAN WORKSTATIONS

BENCHMARK TESTS: SAFE STATIONS FOR NETWORKS

WHAT THE NUMBERS MEAN

We observed few differences in performance among the systems on the Conventional Memory benchmark test. But you should note that Liberty's 20-MHz Network Station Series G had a score on this test more typical of the 16-MHz systems. The reason probably lies in the fact that the Liberty uses 100-ns. chips, while most of the competition uses 80-ns. chips.

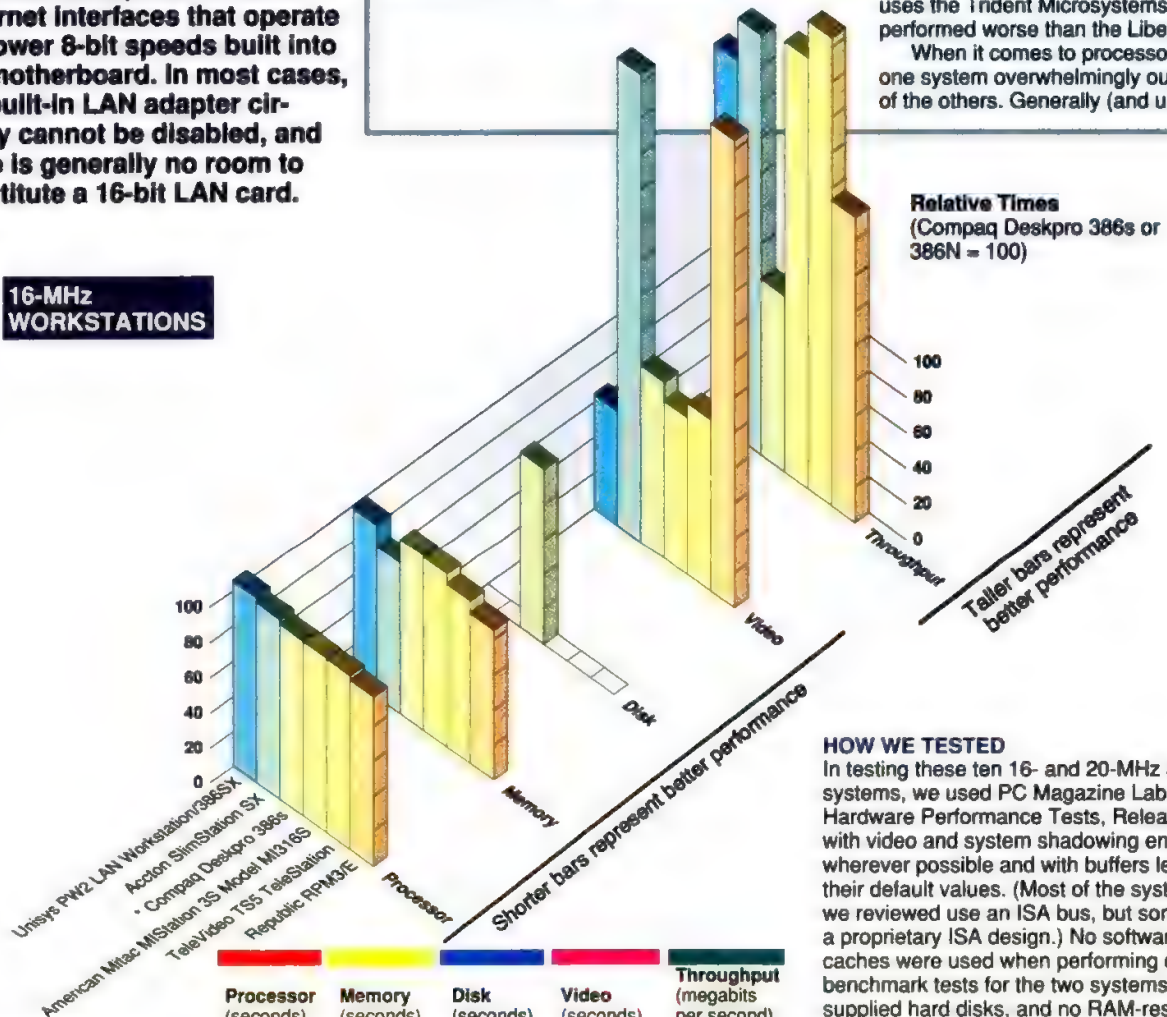
The Direct to Screen test revealed some differences in this roundup of secure LAN workstations. Interestingly, the integrated 16-bit Tseng Laboratories

chip set in Datamedia's 20-MHz NETmate/sx20 system provided the best score in the roundup, while Liberty's 20-MHz Network Station Series G, which uses the same integrated Tseng chip set, provided a Direct to Screen score significantly below average. The difference is that the Tseng chip set on the Liberty was built into an 8-bit architecture, while the Datamedia takes full advantage of the chip's 16-bit design. Only Accton Technologies' SlimStation SX, which uses the Oak Technologies chip set, and Republic Technology's RPM3/E, which uses the Trident Microsystems chip set, performed worse than the Liberty.

When it comes to processor speed, no one system overwhelmingly outshone any of the others. Generally (and unsurpris-

There were few very noticeable differences in performance among the secure LAN workstations we reviewed. Most obvious was that users interested in the throughput rate of workstations should opt for a 16-bit LAN interface. While some of these machines provide 8-bit Ethernet cards, others have Ethernet interfaces that operate at slower 8-bit speeds built into the motherboard. In most cases, the built-in LAN adapter circuitry cannot be disabled, and there is generally no room to substitute a 16-bit LAN card.

16-MHz WORKSTATIONS



HOW WE TESTED

In testing these ten 16- and 20-MHz 386SX systems, we used PC Magazine Labs' Hardware Performance Tests, Release 5.6, with video and system shadowing enabled wherever possible and with buffers left at their default values. (Most of the systems we reviewed use an ISA bus, but some use a proprietary ISA design.) No software disk caches were used when performing disk benchmark tests for the two systems that supplied hard disks, and no RAM-resident programs were loaded for any tests.

All the systems were tested attached to a Compaq Systempro that acted as a NetWare 3.11 server. The Systempro was configured with a 33-MHz 386 processor and 8MB of RAM. Since all the PCs were attached to the NetWare server in order to load the benchmark programs for testing, an additional 70K of conventional memory in each machine had to be used for the network shell; this did not affect test scores.

* Reported for comparison. We substituted the Deskpro 386N on the throughput test.
N/A—Not applicable: This machine does not include a hard disk.

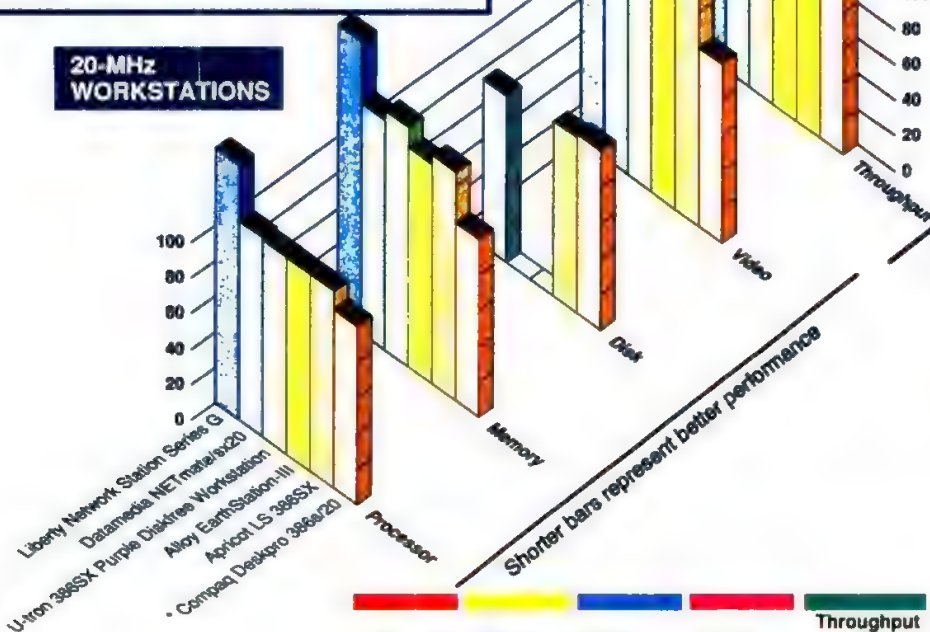
CONNECTIVITY SECURE LAN WORKSTATIONS

ingly), the 20-MHz systems provided incrementally faster scores than the 16-MHz machines. But again, the Liberty trailed behind its 20-MHz peers, providing scores more in line with 16-MHz machines.

Only two systems came equipped with hard disks: The Apricot LS 386SX included a 52MB hard disk, and the Datamedia NETmate/sx20 came with a 100MB unit. On the DOS File Access test, the drives of both systems performed slightly better than the drives included with the 386SX systems we have seen in previous reviews.

On the Workstation Throughput Evaluation test, the Apricot led the pack, perhaps because of the combination of its 20-MHz processor and its built-in 16-bit Ethernet architecture running at 10 MHz.

20-MHz WORKSTATIONS



	Processor (seconds)	Memory (seconds)	Disk (seconds)	Video (seconds)	Throughput (megabits per second)
Liberty Network Station Series G	4.44	0.77 ①	N/A	3.57 ●	2.31 ①
Datamedia NETmate/sx20	3.49	0.61	61.02	1.04 ②	2.24 ③
U-tron 386SX Purple Diskfree Workstation	3.44	0.63	N/A	1.43	2.68
Alloy EarthStation-III	3.43	0.58	N/A	1.75	2.32 ③
Apricot LS 386SX	3.43	0.60	64.41	1.81	2.86
* Compaq Deskpro 386s/20	3.11	0.47	65.73	0.88	1.04

* Reported for comparison. We substituted the Deskpro 386N on the throughput test.
N/A—Not applicable: This machine does not include a hard disk.

All the PCs were tested with 4MB of RAM, with the exception of the Apricot LS 386SX. The Apricot came with 5MB of RAM installed; we tested it that way because the basic 1MB model can be upgraded only to a full 5MB.

Most of the systems did not include hard disks, and none came with caching hard-disk controllers. The margin of error for the processor, memory, and video tests

is 0.05 seconds; take this into account when making purchasing decisions based primarily on speed.

We also ran PC LAN Labs' Workstation Throughput Evaluation benchmark test on each system to test the throughput of the Ethernet interface that came with each system. We ran the test using 10-megabit-per-second thin Ethernet cable between the PC and the server.

Relative Times
(Compaq Deskpro 386s/20 or
386N = 100)

HIGHLIGHTS

● Liberty: Memory, Video

The Liberty Network Station Series G's scores on most of the tests were uniformly poor for a 20-MHz system. The slow video score is due to the company not making full use of the Tseng Laboratories chip's 16-bit design. The unit's slow score on the memory test can be attributed to its use of 100-ns chips.

● Datamedia: Video

The Datamedia NETmate/sx20's score on the Direct to Screen test was the most impressive we saw. The system fully uses the excellent 16-bit Tseng Laboratories chip set, a proven performer on past PC benchmark tests.

● Unisys, Republic, Liberty, Datamedia, Alloy: Throughput

These systems all provide either built-in 8-bit Ethernet interfaces or 8-bit Ethernet cards. They achieve noticeably less throughput than machines that use 16-bit Ethernet interfaces.

■ The Instruction Mix benchmark test times a series of tasks specific to the processor. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, a faster time means better overall computer performance.

■ The Conventional Memory benchmark test measures the read/write speed of the first 640K of memory. Slower relative times can indicate the presence of memory wait states or memory chips rated at relatively slow access speeds.

■ The disk score is the sum of the small-record and large-record DOS File Access benchmark test times. Each test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. No software cache is employed.

■ The Direct to Screen benchmark test indicates the speed of the video adapter memory. A good score indicates that information can get to the screen quickly, particularly when programs bypass the computer's video BIOS.

■ The Workstation Throughput Evaluation test reports the throughput recorded during the performance of a standardized task by a single PC on the network. The test program performs a sequential read, a random read, a sequential write, and a random write using a 1MB file. The record size systematically rotates among 16K, 4K, and 512 bytes. The throughput is reported in megabits per second.

CONNECTIVITY

SECURE LAN WORKSTATIONS

386SX-BASED PC'S: RECENT REVIEWS

20-MHz PC's Model	Bus	Price of standard configuration	80386 Instruction Mix test score (seconds)	PC Magazine review (issue date and page)
April 30, 1991				
AGI 3000B	ISA	\$3,998	3.00	218
AST Premium II 386SX/20 Model 113V	ISA	\$4,770	3.10	218
CompuAdd 320sc	ISA	\$3,411	3.04	226
Computer Market Place Ultra 386SX-20	ISA	\$2,357	3.01	227
Diamond Technologies DT 386SX-20	ISA	\$2,084	3.09	231
Elitech 2200	ISA	\$2,649	3.08	232
Leading Edge D3/SX20c	ISA	\$3,874	3.57	233
Micro Express ME 386-SX/20 Caching	ISA	\$2,364	3.05	234
Zenith Z-386 SX-20	ISA	\$5,597	3.31	244
November 27, 1990				
Acer 1120SX	ISA	\$3,785	3.45	104
ACMA 386SX/20	ISA	\$2,095	3.11	106
ALR PowerFlex 20CSX	ISA	\$4,198	3.01	106
Austin 386SX-20 PowerStation	ISA	\$2,590	3.34	110
Bitwise 386-SX	ISA	\$2,360	3.37	112
Blackship 386SX 20	ISA	\$2,395	3.34	122
Boss 386SX-20	ISA	\$3,895	3.36	125
Bus SX-20	ISA	\$2,149	3.16	128
Club Model 320SX	ISA	\$2,444	3.02	128
Compaq Deskpro 386s/20	ISA	\$5,318	3.11	131
Core 386-SX-20	ISA	\$2,660	3.46	132
Dell System 320LX	ISA	\$3,199	3.46	135
Diamond 386SX/20	ISA	\$1,799	3.37	136
DTK Peer 2030	ISA	\$2,735	3.31	160
Dynamic Decisions Dynex 386SX 20MHz (caching)	ISA	\$2,470	3.12	160
Dynamic Decisions Dynex 386SX 20MHz (noncaching)	ISA	\$1,990	3.34	165
FastMicro FastData 386/SX20	ISA	\$1,699	3.35	162
Fountain FTN-386SX/20	ISA	\$2,295	3.16	174
Micro Express ME 386-SX/20	ISA	\$2,034	3.36	177
Micro Express ME 386-SX/20/Caching	ISA	\$2,184	3.11	177
MMI-386SX20 MultiMicro	ISA	\$2,643	3.45	178
National Micro Systems Flash 386SX-20 (caching)	ISA	\$1,799	3.11	182
National Micro Systems Flash 386SX-20 (noncaching)	ISA	\$1,609	3.37	182
NCR PC 386SX20	ISA	\$5,195	3.03	185
NCR PowerMate SX 20	ISA	\$5,298	3.14	188
Northgate Slimline 386SX/20	ISA	\$2,899	3.05	188
Novacor Novas 386SX-20	ISA	\$2,166	3.35	191
Panther 386SX/20	ISA	\$1,699	3.38	192
PC Brand 386SX-20	ISA	\$2,327	3.47	194
PC Connections/Destiny 386SX ProLine	ISA	\$2,815	3.35	197
Peregrine 386 20/32cSX	ISA	\$2,779	3.11	197
Premier 1550	ISA	\$1,599	3.42	203
PSG 386SX202	ISA	\$2,195	3.37	198
Softworks Development Citus 386SX TS 20	ISA	\$2,595	3.34	204
Tangent 386SX/20	ISA	\$2,189	3.34	204
Tenex 386SX/20	ISA	\$2,008	3.34	206
Treasure Chest TC 386 SX20	ISA	\$1,859	3.85	210
Twinhead Superset 590	ISA	\$2,645	3.44	213
Wedge WT 386-20SX	ISA	\$2,253	3.44	214
Zeos 386SX-20	ISA	\$2,495	3.11	217
October 30, 1990				
NCR PC386sx/MC20	MCA	\$4,844	3.33	157
Reply 386SX/20	MCA	\$5,335	3.39	162
Tandy 5000 MC	MCA	\$7,628	2.77	162

 —Editors' Choice

CONTINUES

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- ▲ 1MB VGA Palette Plus Card
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- ▲ Swan Mouse and Mousepad
- ▲ 101-Key Keyboard
- ▲ Windows 3.0
- ▲ DOS 5.0 **\$3295**

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- ▲ 220MB 12.6ms IDE Hard Drive
- ▲ 12" Monochrome Monitor
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- ▲ 8) 16-Bit Expansion Slots
- ▲ 101-Key Keyboard
- ▲ DOS 5.0 **\$3195**

- ▲ 4MB RAM, 128K SRAM Cache
- ▲ 220MB 12.6ms IDE Hard Drive
- ▲ VGA (1024 x 768) Monitor
- ▲ 1MB VGA Palette Plus Card
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Swan Mouse and Mousepad
- ▲ 101-Key Keyboard
- ▲ Windows 3.0
- ▲ DOS 5.0 **\$3995**

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- ▲ Ports: 2 Serial, 1 Parallel
- ▲ 8) 32-Bit EISA Expansion Slots: 6 Bus Masters, 2 Bus Slaves
- ▲ 101-Key Keyboard **\$4195**
- ▲ DOS 5.0

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Service and
Reliability Survey,
September 25, 1990

"Swan's engineers clearly demonstrated that the time of building PC's with whatever parts are cheapest is over. The compatibility issues simply take too long to resolve. Changing the components too frequently also raises questions about the manufacturer's ability to service and support the machine."



Bill Machrone,
Editor-in-Chief,
September 11, 1990

"Swan Technologies is wringing thunder and lightning out of the (486) chip...silently ridiculing 486 machines that are less well endowed or can't match Swan's price."

"When it came to extended memory access, the Swan 486 rushed past the other systems—an important consideration for users running operating systems or shells that take full advantage of extended memory."



October 1990

"Not only does it (386/25) look good, the small board uses the latest, most reliable design and manufacturing techniques...it's faster than other uncached machines tested."



November 1990

"Swan's computer (386/33) may have lost some of it's price, but it hasn't lost a dime's worth of quality."



August 1991

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386SX-BASED PCS: RECENT REVIEWS

16-MHz PCs Model

Model	Bus	Price of standard configuration	80386 Instruction Mix test score (seconds)	PC Magazine review (issue date and page)
October 30, 1990				
Apricot Qi 300-80	MCA	\$5,190	4.23	122
IBM PS/2 Model 65SX	MCA	\$6,395	4.42	124
Wang MC 350 16S	MCA	\$5,790	4.24	163
August 1990				
ACMA 386SX	ISA	\$1,815	4.58	102
Amax 386SX Business System	ISA	\$1,655	4.55	104
BroadAx BSI 386SX	ISA	\$1,904	4.05	109
CAF Master 386SX/16	ISA	\$2,170	5.73	113
Computer Market Place Ultra 386SX	ISA	\$1,789	4.55	115
Coté 386 Plus	ISA	\$1,785	4.31	117
Ci Microsystems 386SX	ISA	\$2,125	4.32	138
Dyna Micro Work Master 386SX	ISA	\$1,900	4.58	138
Express Micro Mart EXP 386SX	ISA	\$1,818	4.57	140
Fortron NetSet 386SX	ISA	\$1,750	4.35	142
Gateway 2000 80386SX	ISA	\$1,850	4.17	149
HiQ386SX-16/20	ISA	\$1,960	4.59	150
Micro Express ME 386SX	ISA	\$1,699	4.26	153
Mitsuba MIT-SXA	ISA	\$2,295	4.39	154
National Micro Systems Flash 386SX-16	ISA	\$1,779	4.58	154
Novacor Novas 386SX-16	ISA	\$1,850	4.32	159
Pan United PC 386/SX Business System	ISA	\$2,270	4.57	162
PCC 2260/16SX	ISA	\$2,364	4.57	167
PSG 80386SX/16	ISA	\$2,295	4.25	167
Tenex 386SX HD VGA System	ISA	\$1,699	4.27	168
Treasure Chest TC 386SX	ISA	\$1,659	4.18	175
January 30, 1990				
Acer 1100/SX	ISA	\$3,265	4.45	99
Advanced Digital Powerlite 386SX	ISA	\$2,175	4.38	100
ALR PowerFlex SX386	ISA	\$2,917	4.55	100
American Mitac MPC 2386	ISA	\$3,689	4.39	103
Arche Rival 386SX	ISA	\$3,959	4.47	104
AST Premium 386SX/16	ISA	\$4,385	4.00	108
AT&T 6386/SX WGS	ISA	\$4,864	4.57	108
Austin 386SX	ISA	\$2,195	4.23	111
Bus 386/SX	ISA	\$2,200	4.50	112
Data General Dasher/386sx	ISA	\$4,490	4.50	112
Epson Equity 386SX	ISA	\$4,297	4.21	121
386SX Gateway 2000 Multiperformer	ISA	\$2,295	4.12	123
IBM PS/2 Model 55SX	MCA	\$4,668	4.46	136
IDS PC-386SX-40	ISA	\$1,995	4.39	137
Lanier 386/16 SX	ISA	\$3,895	4.37	140
Mitsubishi MP386s	ISA	\$5,195	4.54	149
MultiMicro MMI16SX	ISA	\$2,299	4.49	150
NCR PC386sx	ISA	\$5,039	4.90	152
NEC PowerMate SX Plus	ISA	\$4,398	4.48	152
Pan United Micro Lab 386/SX	ISA	\$2,199	4.55	157
PC Designs GV386SX	ISA	\$3,435	4.38	158
Polywell Poly 386SX	ISA	\$2,150	4.39	158
Software Developments Citus 386sx TS	ISA	\$2,930	4.24	161
Sunburst 386SX-16	ISA	\$2,149	4.22	164
Tandon PAC 386sx	ISA	\$4,087	4.84	164
Tandy 4000 SX	ISA	\$2,599	4.38	166
Tangent 316SX	ISA	\$2,413	4.53	170
Tatung TCS-8800S	ISA	\$1,995	4.27	170

 — Editors' Choice

CONTINUES

386SX-BASED PCS: RECENT REVIEWS

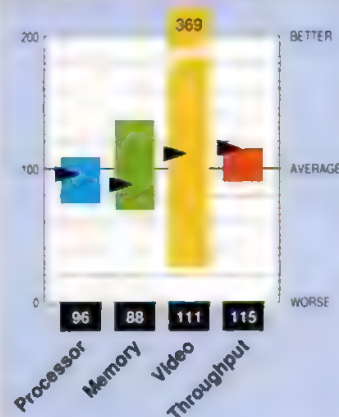
16-MHz PCs (continued) Model	Bus	Price of standard configuration	80386 Instruction Mix test score (seconds)	PC Magazine review (issue date and page)
January 30, 1990				
UTI 386 SX	ISA	\$2,126	4.38	172
Wang PC 350/16S	ISA	\$4,620	4.38	175
Zeos 386SX 16	ISA	\$2,252	3.99	179
August 1989				
ALR FlexCache SX386Z	ISA	\$1,795	3.92	107
ALR VIP SX386	ISA	\$1,895	3.92	107
Dell System 316	ISA	\$2,999	4.40	124
Everex Step 386is	ISA	\$2,799	4.08	127
Mitsubisa 386SX Workstation	ISA	\$2,145	4.25	130
NCR PC916SX	ISA	\$4,995	4.94	132
NEC PowerMate SX	ISA	\$2,899	4.57	134
Spear 386/16SX	ISA	\$1,659	4.22	140
Swan 386SX	ISA	\$1,499	4.39	157
Twinhead Superset 490	ISA	\$1,699	4.38	169
Zeos 386-16-SX	ISA	\$1,895	4.23	171

 — Editors' Choice

ENDS

Apricot LS 386SX

▶ TEST RESULTS



In Short: The Apricot LS 386SX led the 20-MHz pack (in a tie) on our processor benchmark test, and it bested all others on the throughput test. In addition to its fine performance, its strength lies in being designed from the ground up to provide sophisticated security. Its combination of features and flexibility make it a top-flight product for users looking to make their LANs secure.

the Apricot system is tough to beat.

You can open the slimline case without any hand tools. A small internal fan keeps the components cool but works quietly. Ports are integrated into the custom motherboard, including a Super VGA interface based on a Chips and Technology video chip set. The integrated Ethernet interface, based on Intel's chip set, includes connectors for coaxial cabling; unshielded twisted-pair and AUI cable are also options. There are no expansion slots and few items you can add aside from an 80387 coprocessor or additional memory, up to a total of 8MB.

TIGHTLY INTEGRATED SECURITY

The Apricot's real story is its complex, stalwart security system. To start the computer, you must unlock it using a unique key. You point an infrared remote control, about the size of a business-card case, at the computer and press a button. The screen prompts you for a user name and password. As in baseball, three strikes and you're out; if you get either item wrong three times, you have to begin again with the infrared key.

Here is where you get a hint of the unit's sophistication, for the master security account can set a variety of options that determine what happens next. The

system can automatically log all attempts at unlocking and store them in special memory. You can set the system to lock all users out for up to an hour after a user fails three log-on attempts.

Each remote control produces a unique

▼

The Apricot's real story is its complex, stalwart security system; this unit was built from the ground up to be practically airtight.

▲

signal, and you can program each computer to respond to one or more remote controls. The system offers various levels of security access; network administrators can assign individual users different rights on a given machine or group of machines. Rights include selective access to hard disks, floppy disk drives, and all

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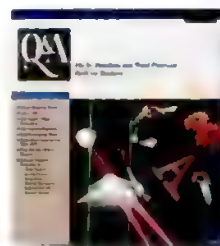
SQL tables. For those of you who need to create sophisticated databases for others, new Q&A includes a complete set of Application Programming Tools that simplify the process and offer powerful shortcuts. And it has full network support for maximizing workgroup productivity.

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Products listed here in red are Microsoft Windows Applications

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 - Adobe TypeSets for Business. . . ea. 95.
 - 9874 □ Adobe TypeAlign 1.0 w/ATM . . . 125
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 - 8367 □ ATM & Plus Pack Bundle 169.
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- 1332 □ PageMaker 4.0 499.

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- 9621 □ Picture Eze 1.0 for Windows 99

Artisoft ... NCP

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- 2452 EtherNet Adapter Card 209.
- 2454 EtherNet Microchannel Starter Kit 649.

Ashton-Tate ... NCP

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- 7336 □ Label Pro 1.0 for Dot Matrix 49.
- 1600 Avery 1st Impression 229.

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- 8040 □ FaceLift 1.5 for WordPerfect 5.0/5.1 59.
- 7569 □ Companion Value Pack 1.0 125.
- 8883 □ Type City Cartridge with Deli 259.

- Typeface Packages each 89.

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- 9695 □ Borland's C++ 2.0 339.
- 1514 □ Paradox 3.5 529.
- 7356 □ Pascal Pro (2nd Edition) 209.

- 9635 □ Object Vision 1.0 call

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- 1434 □ New Print Shop 39.

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- 6419 □ PC-File 6.0 89.

Care ... NCP

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- 8114 □ Backup 7.0 (DOS and Windows) 84
- 1675 □ Commute 1.0 84.
- 9751 □ AntiVirus 1.0 84.

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- 8849 □ Instant Recall 1.2 64.

CompuServe ... NCP

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Contact Software ... NCP

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- 4798 □ PROCOMM PLUS 2.0 69.

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- 7351 □ PerFORMPRO 1.0 179.

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- 8378 □ PC Anywhere IV 4.03 105.

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- 3950 □ Fastback Plus 3.0 119.

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Geoworks ... NCP

- 8789 □ Ensemble 1.2 129.

Gibson Research ... NCP

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- 4880 □ One Write Plus Acct. Sys. 2.06 179.

Hayes ... NCP

- 7983 □ Smartcom Exec 2.0 79.
- 9639 □ hLANstep 1.0 349.

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- 2669 □ Hollywood 1.0 for Windows 319.

Individual Software ... NCP

- 6222 □ Resume Maker 1.3 29.

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1852 ☐ 1-2-3 2.3 Upgrade 95.
2755 ☐ 1-2-3 for Windows 1.0 419.
2747 ☐ 1-2-3/W and Ami Pro Upgrade 159.
5799 ☐ Ami Pro 2.0 309.
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7931 ☐ Random House Encyclopedia 1.0 68.

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7010 ☐ Windows 3.0 99.
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2904 ☐ Works 2.0 99.
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2856 ☐ Excel 3.0 for Windows 329.
8137 ☐ Office for Windows 499.
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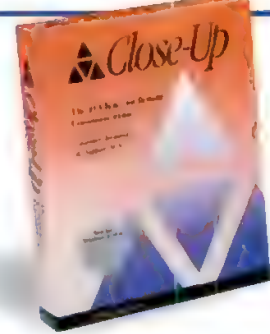
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6600 ☐ Superbase 4.0 for Windows 1.3 429.

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- 7420 ☐ Check It 3.0 89.
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4214 ☐ WordPerfect Office PC 89.
3804 ☐ WordPerfect 5.1 265.
6685 ☐ DrawPerfect 1.1 279.
- WordStar International ... NCP**
- 1482 ☐ Correct Grammar 1.0 for Windows 65.
6791 ☐ WordStar Professional 6.0 199.
- XTREE ... NCP**
- 1202 ☐ XTree Easy 1.0 45.
6161 ☐ XTree Gold 2.0 95.
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8270 ☐ Aircraft and Scenery Designer 1.0 29.
- Microsoft Press (Books)**
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8136 Running Microsoft Excel 22.
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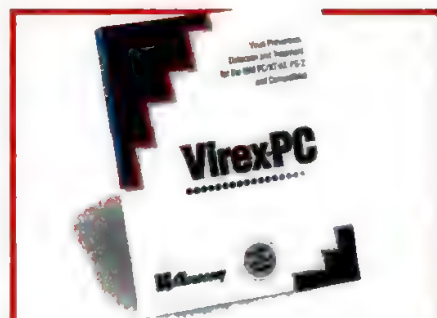


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- 4659 ☐ Chessmaster 2100 (CP) 35.
7372 ☐ World Atlas 2.0 42.
- Stone & Associates ... NCP**
- 3439 ☐ 2nd Math 4.2 27.
- Toyogo ... NCP**
- 7676 ☐ Nemesis Go Master Deluxe 4.7 88.
- True BASIC, Inc. ... NCP**
- ☐ Kemeny/Kurtz Math Series each 45.
- Walt Disney Computer Software ... CP**
- 2629 ☐ Mickey's 123's 35.
2624 ☐ Mickey's ABC's 35.

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6747 Safe 400S 399.
- American Power ... 2 years**
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1825 2400etc/i Modem (w/9600 SendFax) 139.
9620 9600etc/e Modem 379.
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- 7001 BOCARAM/AT PLUS (0k) 119.
7150 BOCARAM/AT PLUS (2 MB) 219.
7139 (4 MB) 329. 7138 (8 MB) 539.
6998 I/O Board for AT 59.
6999 I/O Board for Microchannel (S/S/P) 109.
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8381 SuperVGA (1 MB, 1024 x 768) 145.
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9876 FasMath 83D87-33 195.
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- Datadesk ... 3 years**
- 6901 Switchboard (modular keyboard) 159.
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- We are an authorized Epson Service Center.
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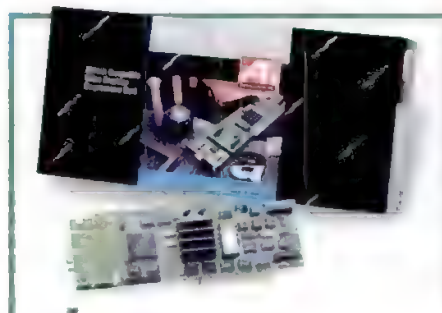
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9031	20 MHz 386 Motherboard for PC	995.
9032	20 MHz 386 Motherboard for XT	995.
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9884	Pocket Edition 2400	129.
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9993	LaserJet IIP (with toner)	1149.
6754	LaserJet III (with toner)	1679.
1959	LaserJet Fax	1399.
Hitachi ... 2 years		
9492	14MVX/LMF 14" SVGA Monitor (1024 x 768) (with low radiation screen)	489.
Intel ... 5 years		
6421	2400B MNP Internal Modem	199.
5119	2400 Baud External Modem	179.
6420	2400EX MNP Modem	229.
7880	9600EX Modem	529.
7552	Netport	489.
2346	Inboard 386/PC with 1 MB	495.
5336	Above Board Plus 8 2 MB	449.
5342	Above Board Plus 8 I/O 2 MB	479.
7782	SatisFAXtion (fax board)	399.
8778	SatisFAXtion for Microchannel	449.
8901	Matched Memory 2 MB (PS/2)	139.
8903	Matched Memory 4 MB (PS/2)	299.
	Matched Memory (for LaserJet IIP, III, IIP IID)	
1810	1 MB	99. 1787 2 MB
1637	Matched Memory (for LaserJet IIP, III, IIP IID)	159.
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4121	80387-25 (25 MHz 80386 CPU's)	219.
1811	80487SX	499.
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2582	Master Piece Plus	99.
7899	Expert Mouse serial	119. 7900 bus
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4518	101 Plus Keyboard	99.
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5801	Game Card (2 ports)	27.
5800	3 button Thunder Joystick	29.
7862	TopTrak (Laptop Trackball)	55.

Logitech ... limited lifetime		
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2343	Trackman Portable	105.
1484	ScanMan 32	169.
7975	ScanMan 256	299.
8694	MouseMan (serial)	69. 9766 (cordless)
	139.	
Megahertz ... 5 years		
1193	T324D 2400 Modem (for Toshiba Laptops)	129.
1196	T224 2400 Modem (for Toshiba Laptops)	129.
1187	T324FM 96/24 Fax Modem (Toshiba Laptops)	299.
1199	T52CC - 2 MB Upgrade for Toshiba T1000 series or T2000SX	239.
Micron Technology ... 2 years		
7595	2 MB Expansion for HP LaserJet IIP or III	119.
7012	Memory Upgrade PS/2 70 - 2 MB	139.
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7597	Microsoft Mouse (bus or serial)	89.
2897	Mouse with Paintbrush (bus or serial)	105.
2898	Mouse with Windows 3.0 (bus or serial)	149.
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1896	Ballpoint Mouse (serial only)	119.
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	PC-TRAC Trackball	
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7271	Import	79. 6330 PS/2
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8975	Complete Font Library (for LJ III)	275.
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6834	Pacific Page (for LJ II) w/2 MB Mem. Brd.	379.
9833	Pacific Page XL (w/accelerator board)	799.
Panasonic ... 2 years		
1410	KXP 1123 (240 cps, 80 col.)	249.
1419	KXP 1124i (240 cps, 80 col.)	319.
8144	KXP 1624 (192 cps, 132 col.)	399.
Practical Peripherals ... 5 years		
3103	2400 Baud Internal Modem	129.
3102	2400 Baud External Modem	179.
8993	2400 Baud Internal Modem (V.42 bis)	169.
8994	2400 Baud External Modem (V.42 bis)	209.



Practical Peripherals ... 5 years

7934 PM9600SA Modem—Practical Peripherals does it again by making communications affordable with their newest modem featuring the data compression & error correction of 9600bps V.32 & V.42bis operation \$469.

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8132	PM2400 Pocket Modem	109.
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2264	PM2400FX96 (modem/fax board)	145.
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8082	Half Page Scanner/400 w/ReadRight	289.
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5200	Isobar 6-6 (6 outlets, Gold Seal Warranty)	59.
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6018	LC1200 (1200W line conditioner)	159.
1528	PS6.0 (600VA on-line UPS)	559.
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4931	VRAM II VGA 512k	259.
Zoom Telephonics ... 7 years		
1307	Int. 2400 Baud w/9600 Baud Fax Modem	109.
1178	Ext. 2400 Baud w/9600 Baud Fax Modem	119.
1170	2400 Baud w/4800 Baud sendfax	69.
1181	2400 Baud V.42bis Modem (2 year)	159.
1167	2400 Baud Internal Modem	69.
1166	2400 Baud External Modem	85.
1494	9600 V.32 Turbo Modem (2 year)	399.



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Conner Peripherals ... 1 year		
8875	CP3044 40 MB IDE HD (25 ms)	219.
2339	CP30104 120 MB IDE HD (19 ms)	399.
1337	CP3204 200 MB IDE HD (16 ms)	649.
IOmega ... 1 year		
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2224	Bernoulli II Transportable 90 MB	799.
2616	Internal 90 MB Bernoulli	799.
2500	PC2B Controller	209.
2530	90 MB Cartridge	149.
2467	90 MB Cartridge Tripak	439.
Mountain Computer ... 2 years		
2917	40-60 MB Internal Tape Drive	259.
5190	DC2000 Pre-formatted Cartridges	ea. 35.
6153	DC2120 Tape Cartridge (5 pack)	149.
Pacific Rim ... 1 year		
1304	1.2 MB External (for any parallel port)	265.
6602	1.44 MB External (for PC/XT/AT)	239.
Plus Development ... 2 years		
8304	Hardcard II XL 50 MB (9 ms)	399.
8287	Hardcard II XL 105 MB (9 ms)	599.

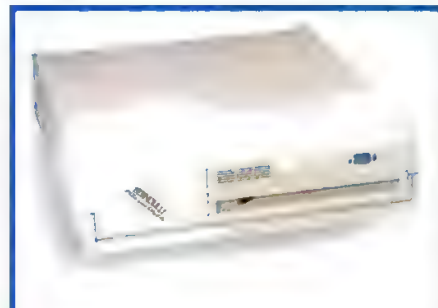
Seagate ... 1 year

4554	40 MB Internal HD ST251-1 (28 ms)	\$249.
1321	ST157A 40 Mb IDE Hard Drive	229.
1320	ST1144A 130 Mb IDE Hard Drive	475.
TEAC ... 1 year		
4670	1.44 MB Drive for PC/XT (3 1/2")	69.
4326	1.44 MB Drive for AT (3 1/2")	89.
4951	720k Drive for PC/XT (3 1/2")	69.
6951	1.2 MB Drive for AT (5 1/4")	75.

DISKS/MEDIA

Maxell ... lifetime

2789	5 1/4" MD2-D 360k Disks (Qty. 10)	10.
2790	5 1/4" MD2-D 1.2 Mb Diskettes (Qty. 10)	15.
2792	3 1/2" DS/DD 720k Diskettes (Qty. 10)	13.
2793	3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10)	21.



IOmega ... 1 year

2224 Bernoulli II Transportable 90 MB—Rugged and built to last, this drive will absorb 1000 g's of shock and provide 90 MB of portable storage. Awards from Byte and InfoWorld. Requires adapter card \$799.



Quarterdeck ... NCP

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3297	3 1/2" DS/DD 720k Diskettes (Qty. 10)	11.
3298	3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10)	18.
6148	3 1/2" DS/DD (3 Pack)	29.
6375	3 1/2" DS/HD (3 Pack)	49.
8185	QD 2040 Tape Cartridge	19.
1895	QD 2120 Tape Cartridge	22.
3M ... lifetime		
3943	DC 2000 Tape Cartridge	19.
6065	DC 2080 Tape Cartridge	25.
3944	DC 600 Tape Cartridge	29.
5679	DC 6150 Tape Cartridge	29.

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6556	256k DRAM (100 ns, set of 9)	call
5510	1 MB x 9 SIMMs (80 nanosecond)	call
5746	1 MB Chips (80 ns, set of 9)	call
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Hayes ... 2 years

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CONNECTIVITY SECURE LAN WORKSTATIONS



Apricot in Canada's Apricot LS 386SX.

I/O ports. The Apricot system even has an option to assign read-only access to a floppy disk drive, so that data cannot be written to a floppy disk.

WALK AWAY WITHOUT WORRY

The remote control also serves as an instant screen blanker. If a user has to leave the computer, a press of the button turns off the screen and locks the keyboard but leaves the computer running. Only the same user or someone with supervisor or master rights can unlock the system.

There is much more; you can create a data encryption key based on a local seed value, force users to change their passwords at set intervals, examine an audit trail of a user's past passwords, control specified users' log-on periods, and set up temporary accounts that expire after a certain period. A lock on the case prevents

access to internal components such as the dedicated security processor. Even if someone manages to open the unit and attempts to defeat the controls, the entire system is designed to lock up until you reboot it by turning it back on and entering a unique ID code provided with each unit.

We found the documentation generally good and installation fairly easy. The system provided some of the best scores we saw on our Instruction Mix test, and led the pack on our Workstation Throughput Evaluation test. Apricot offers free technical support from 9:00 to 5:00 E.S.T. The phone number is toll-free in Canada, but not in the United States.

In short, the Apricot LS 386SX offers some of the most sophisticated security controls for this class of machine at a price competitive with systems that are far less secure. If you need workstations that provide extensive security features with minimum hassle for either an Ethernet or Token-Ring network, this system is hard to beat.

DATAMEDIA CORP. NETmate/sx20

The NETmate/sx20 from Datamedia Corp. looks much like any other 386SX slimline desktop system, with a floppy disk drive in front and I/O ports on the back. But a small slot on the right side sets this workstation apart from the rest. The specially designed slot holds a Securecard, an IC (integrated circuit) memory device about the size of a credit card.

The unit carries a list price of \$2,395 for the base model with 2MB of memory and a 1.44MB floppy disk drive, or \$3,095 in our tested configuration with 4MB RAM, a 100MB Conner hard disk, a floppy disk drive, Super VGA circuitry with 256K of video memory, a Forefront 14-inch Super VGA monitor, and a Western Digital EtherCard Plus LAN adapter. The NETmate is one of the most secure network workstations you can purchase; without a Securecard in place, it is a 12.5-pound mass of inert electronics.

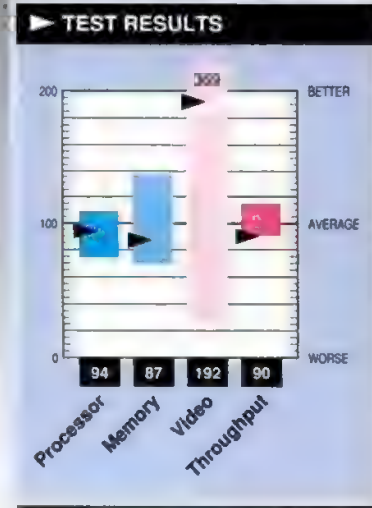
The card-based security system gives network administrators a great deal of flexibility. Each user gets a card, which can be programmed with multiple profiles to give a person access to different workstations on the network. If you're the



The NETmate/sx20 from Datamedia Corp.

administrator, you can also vary a user's rights and resources on different workstations; for example, you can give someone use of a printer on one workstation, but not on another. You can even define multiple sets of access conditions to a single workstation, depending on the individual. You might want some people

Datamedia NETmate/sx20



In Short: Datamedia Corp.'s NETmate/sx20 generally provides typical 20-MHz 386SX performance. Its throughput score was on the slow side, but its video score was the best of any product we saw in the 20-MHz group. Its standout feature is its powerful and flexible security system, with a special security-card slot at the side of the machine. Additionally, you can install up to 32MB of RAM in the system—more than on any of the other machines reviewed here. Network administrators will appreciate that Datamedia offers a retrofit option to add the same security to existing workstations.



FACT FILE

EDITORS' CHOICE

Apricot LS 386SX

Apricot in Canada, 111 Granton Dr., #401, Richmond Hill, Ontario L4B 1L5, Canada; 800-268-1604 (Canada only), 416-492-2777.

List price (tested configuration): \$3,990.

Memory: 5MB 80-ns. DIPS

Disk drives and controller: 17-ms. Quantum ProDrive LPS 52AT with 52MB IDE, 1.44MB floppy disk drive.

Display: Chips & Technologies' Super VGA adapter with 256K video RAM, Apricot 14-inch monitor.

LAN adapter: Integrated 16-bit Ethernet interface based on Intel chip set.

Software: DOS 5.0, expanded memory manager.

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"Pizazz Plus is an excellent screen capture program, producing high-quality output, saving files in several formats and providing the best color adjustment features of any reviewed products." PC Week⁴

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"For such a complex program, ease of use is one of Pizazz Plus' main features." Ventura Professional⁶

"Pizazz Plus is a reasonably priced, useful utility for a variety of applications" Info World⁷

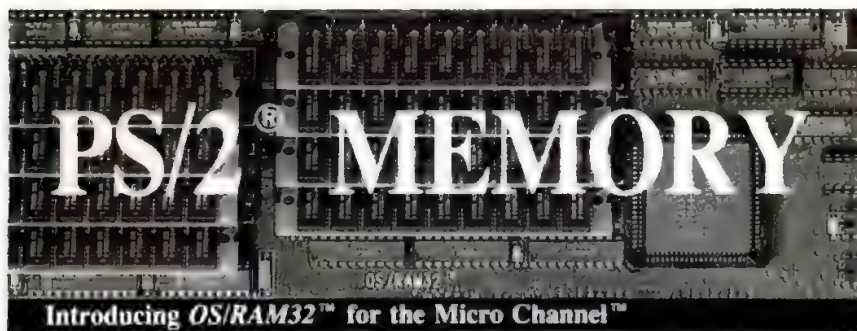
"Pizazz Plus provides the most sophisticated mapping of screen colors to black-and-white printer output." PC Magazine⁸

"It's well worth the price" Home Office Computing⁹

"Pizazz Plus offers an extraordinary package for color oriented publications work." Ventura Professional¹⁰

"Pizazz Plus—The Ultimate Screen Dump Utility. There's no question that Pizazz Plus is another one of those products that few of us can get along without. It should be included when you buy DOS." Computing Now¹¹

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to use a machine's floppy disk drive only when booting locally, in which case you would lock them out of the network. But if they choose to boot off the network, you can lock out the floppy disk drive instead.

OTHER SECURITY FEATURES

Other sophisticated features include a built-in Corporate ID feature that prevents people from using Securecards from other installations. The system also provides a quick-blanking capability for

workstation screens: When a user pulls out the Securecard while the machine is running, the screen goes blank, the keyboard locks, and all CPU activity halts until the card is reinserted. This is not as handy as some other systems that allow processing to continue while the user is away from the machine, but it's useful just the same.

Another important advantage of the Securecard system is its availability as a retrofit option for most PCs, which allows you to upgrade an existing network of various PCs to take advantage of the security features offered by the NETmate (see the sidebar "Playing It Safe: Security Options for Existing Workstations").

The rest of the computer is fairly typical, with a serial, a parallel, and a mouse port, and three 16-bit ISA expansion slots. The system is somewhat atypical in this class of machines in that it supports up to 32MB of RAM; the majority of the systems in this roundup support no more than 8MB. A Super VGA adapter, integrated on the custom motherboard and based on a Tseng Laboratories chip set, is capable of 800-by-600 resolution in the model we tested, or 1,024-by-768 resolution with a \$450 video RAM upgrade to 1MB. The

CONNECTIVITY

SECURE LAN WORKSTATIONS

unit generally had performance times typical for a 20-MHz 386SX system, although its scores on the Direct to Screen test were particularly impressive.

STRONG DOCUMENTATION

The system's documentation is strong; it's easy to set up the unit, especially since you have a floppy disk drive as part of the workstation (provided your Securecard gives you access to it!). If you need assistance, technical support is available via a toll-free number from 8:00 to 5:00 E.S.T. Support is free for the first year.

The NETmate has a reasonable price, and also has the advantage of allowing more RAM than any other system reviewed here. Its security features are among the most comprehensive of the systems we saw. In many respects, the NETmate stands head and shoulders above the majority of its competitors.

LIBERTY ELECTRONICS USA INC.

Liberty Network Station Series G



The Liberty Network Station Series G.

If you want to bring the power of the network to users whose desktop real estate is at a premium, take a look at the Liberty Network Station Series G from Liberty Electronics USA. It takes up no more desk space than a keyboard and a monitor on a tilt-and-swivel base.

The computer is built into the base of its black-and-white VGA monitor, with a footprint smaller than 10 inches on each side. The base model of the 20-MHz 386SX version comes with 2MB of mem-



FACT FILE

NETmate/sx20

Datamedia Corp., 20 Trafalgar Sq., Nashua, NH 03063; 603-886-1570.

List price (tested configuration): \$3,095.

Memory: 4MB 80-ns. SIMMs.

Disk drives and controller: 19-ms. Conner with 100MB IDE, 1.44 MB floppy disk drive.

Display: Tseng Laboratories Super VGA adapter with 256K video RAM, Forefront Technology 14-inch monitor.

LAN adapter: 8-bit Western Digital EtherCard Plus interface.

Software: Expanded memory manager.

CIRCLE 843 ON READER SERVICE CARD

CONNECTIVITY SECURE LAN WORKSTATIONS



FACT FILE

Liberty Network Station Series G

Liberty Electronics USA Inc., 270 E. Grand Ave., South San Francisco, CA 94080; 800-745-7011, 415-742-7000.

List price (tested configuration): \$1,788.

Memory: 4MB 100-ns. SIMMs.

Display: Integrated Tseng Laboratories VGA with 1MB video RAM; built-in 14-inch monitor.

LAN adapter: Integrated 8-bit Ethernet interface based on Western Digital chipset.

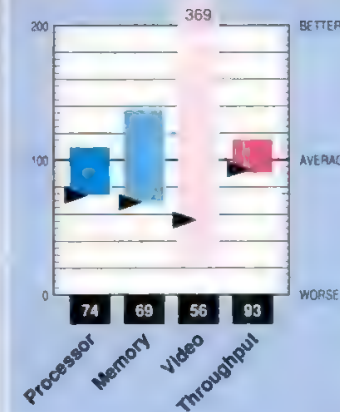
CIRCLE 644 ON READER SERVICE CARD

ory and a list price of \$1,588; the version we tested had an upgrade to 4MB and a \$1,788 list price. Liberty offers other versions, including a 16-MHz 386SX model.

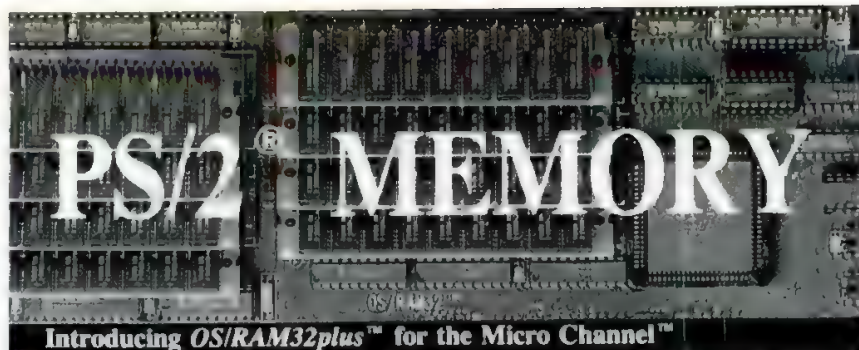
These prices make the Series G a most attractive and competitive value. It includes a monitor and an integrated 8-bit

Liberty Network Station Series G

TEST RESULTS



In Short: Liberty Electronics USA's Network Station Series G, a computer built into the base of a monitor, provided some of the lowest scores on our benchmark tests. Its performance was generally more in line with a 16-MHz machine, rather than reflecting its 20-MHz processor. The Series G offers a totally diskless design as its main security feature, as well as a tiny footprint at a relatively low list price. The system is hampered by a monochrome VGA display, but it represents a workable alternative if it suits your installation's requirements.



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CIRCLE 151 ON READER SERVICE CARD

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Ethernet interface for less than some competing machines that do not include displays. Nevertheless, this design does not skimp on features.

The Ethernet interface supports coaxial BNC and AUI 15-pin connectors and includes a remote-boot ROM. The machine also offers one parallel and two serial ports on the custom motherboard, and on-board VGA circuitry based on the Tseng Laboratories chip set.

TRULY DISKLESS

You won't find any drive bays, which should hardly be surprising, given the tiny size of the case. The machine also has no standard expansion bus slots, although a proprietary slot can accept a special Texas Instruments 34010-based high-performance graphics card as an option. The card does not provide more-detailed resolution, but rather increases display performance, a feature that might be valuable to users of graphics-intensive applications such as AutoCAD or Microsoft Windows.

It is a little surprising that the standard display is VGA only, given the relatively low additional cost of Super VGA adapters in today's market. But the lower resolution does help keep the cost of the

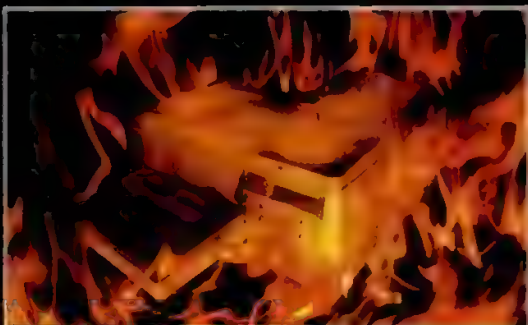
monitor down. Since many network users deal only in character-based applications anyway, neither the VGA-only resolution nor the monochrome display are likely to be a major shortcoming for a good number of installations. The only problem is that the monochrome image is based solely on the green component of the video signal, which may result in some unreadable screens (green or yellow on white, red or magenta on black) for color programs. To let users have a choice of video systems, the company is planning a pizza-box version of the workstation that will not include a display.

Aside from the absence of disk drives, the Series G contains few security features. A physical lock deactivates the keyboard and you can disable the motherboard I/O ports through the setup program, but these security features are not as robust as the ones with some other systems.

PERFORMANCE AN ISSUE

Installation and setup are relatively easy. The documentation is well-written and illustrated, but the information is a bit thin and missing some topics. It would also benefit from an index. Support is free, but

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not at a toll-free number. Liberty covers the lines from 8:30 to 5:00 P.S.T.

The Series G was one of the few computers we tested that produced benchmark test figures significantly different from the results of the other machines. Despite its 20-MHz processor, the Series G turned in times on most of the tests that were more in line with the 16-MHz models we reviewed.

If a monochrome display and security based on diskless operation are sufficient for your needs, the Series G will take about as little of your funds as it will of your desktop. If the features are a good match for your needs, it could be an attractive value.

REPUBLIC TECHNOLOGY CORP.

Republic RPM3/E

The design of the Republic RPM3/E combines some of the best features of typical computers and diskless workstations. A small desktop unit from the Republic Technology Corp., it measures about a

CONNECTIVITY SECURE LAN WORKSTATIONS



The RPM3/E from Republic Technology Corp.

foot square and 2.5 inches high. The system is modestly priced: \$1,295 for the base model 16-MHz 386SX with 2MB RAM, and \$1,435 for the configuration we tested with 4MB memory, on-board Super VGA circuitry, and an integrated 8-bit Ethernet interface. Republic does not, however, supply a monitor for the unit.

The RPM3/E's main security feature is that it has no drive bays. A BIOS option allows you to password-protect the I/O ports, but your choices are either to lock them all or to unlock them all. Since a mouse attached to one of the serial ports would be locked under this system, it may be a major hindrance to *Windows* or graphics program users. Even though you can lock all the ports, the machine has no case lock, so it's a simple matter to get inside and change the DIP switch setting that unlocks them. The procedure is even detailed in the user manual, so this is not a particularly sturdy deterrent.

BOOT LOCALLY FROM RAM

The Republic RPM3/E workstation comes with a welcome feature, an emulated floppy disk drive in the form of special static RAM. You can format it and load it with network drivers and other software so that the unit can boot locally (like a standalone PC) and log onto the network automatically. A file-transfer program in ROM facilitates the loading of such files with the aid of another computer and a null-modem cable. If you find that you need more storage,

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CONNECTIVITY

SECURE LAN WORKSTATIONS

middle, but with only a 2.5-inch thick case, there is no room for a card.

OPERATION SIMPLE

The disk emulator and the absence of a remote-boot PROM make operation simpler; there's no need to tangle with creating boot images on the file server. The manual is fair, with some illustrations and moderately good coverage of information, but it is lacking an index and page numbers in the table of contents. Free technical support is available via a toll-free number from 8:00 to 6:00 C.S.T.

The RPM3/E performed about as expected for a 16-MHz 386SX machine, with some exceptions. Its Direct to Screen scores were slow, and it had about half the throughput of any other workstation in the field on the Workstation Throughput Evaluation test. The company says it will be shipping the system with a 16-bit Ethernet interface by the time you read this, which should double the throughput.

The system we reviewed came with DR DOS in ROM, but MS-DOS 5.0 in ROM



FACT FILE

Republic RPM3/E

Republic Technology Corp., P.O. Box 141006, Austin, TX 78714; 800-622-2177, 512-834-2222. List price (tested configuration): \$1,435.

Memory: 4MB 80-ns. SIMMs.

Display: Trident Microsystems VGA adapter with 256K video RAM.

LAN adapter: Integrated 8-bit Ethernet interface based on Western Digital chip set.

Software: DR DOS 5.0, Western Digital Superdisk drivers.

Requires: Monitor.

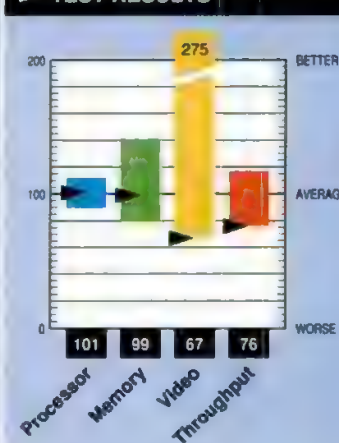
CIRCLE 645 ON READER SERVICE CARD

you can upgrade the base 128K of static RAM to a total of 384K.

Inside the computer, you will find a custom motherboard with all the features integrated into it: two serial and one parallel port, a Super VGA adapter, and an Ethernet interface. The Super VGA adapter, driven by a Trident chip set, is capable of 800-by-600 resolution. The motherboard also has a 16-bit ISA expansion slot in the

Republic RPM3/E

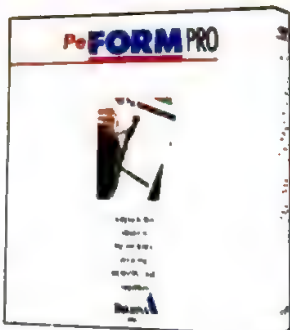
TEST RESULTS



In Short: The RPM3/E from Republic Technology Corp. has average performance for the 16-MHz 386SX class, although its throughput test time was poor and its video performance was slow. It is a well-designed diskless workstation with an attractive price, but it falls a bit short in terms of serious security measures.

★ PerFORM PRO

(Deitna) Deitna puts the power and versatility of Windows 3.0 behind its newest selection of advanced design tools with PerFORM PRO. Meet your "high-end" form design and data management requirements with customized electronic business forms. Unique features include form folders, electronic signature security, if...Then statements and entry validation, in addition to enhanced graphics image importing and full color support. **BS2604 \$149.**



★ Presentation Task Force

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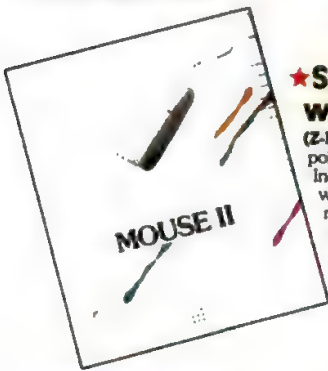
★ PackRat 4.0

(Polaris) PackRat is a powerful information manager indispensable for the busy executive. PackRat makes it a snap to manage business and personal information of all types—names, phone numbers, meetings, to-do lists, notes and much more. Exchange information with Word for Windows or Ami Pro. Awarded PC Magazine's "Editor's Choice" and "Best of 1990." **BS2804 \$250.**



★ SuperMouse II with Windows 3.0

(Z-Mix) The SuperMouse II is a precision pointing device suitable for every application. Includes Windows 3.0 and drivers that work with virtually any program that supports a mouse. Includes special "pop-up" menu software which allows you to use SuperMouse II with programs that aren't mouse compatible. **Box: IN1013/5. Serial: IN1003/5. PS/2: IN1023/5. \$81ea.**



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HP NewWave 3.0 on Windows



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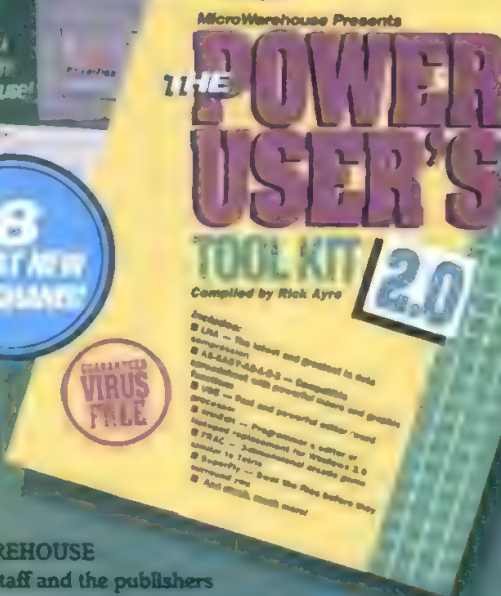
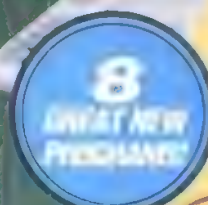
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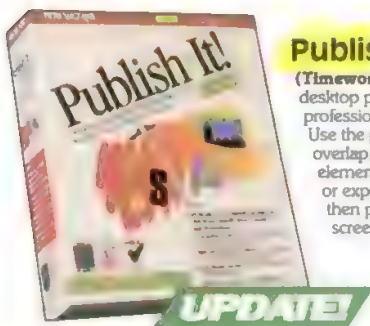
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(Timeworks) Publish It! 2.0 is a full-featured desktop publisher that allows you to create professional looking documents in minutes. Use the program's built-in layout tools to overlap, reposition and resize text and graphic elements on the page. Easily change a layout or experiment with alternative page layouts then print exactly what you see on the screen. **GR2334 \$135.**



Hijaak

(Inset Systems) Hijaak captures screens and converts graphics files from one format to another. Features viewable EPS file, typeset quality text screen; converts CAD images to faxable format and captures LaserJet and HPGL plotter output at full resolution directly from the application. Also converts scanner files in TIFF format to a more usable type. **UT1614 \$99.**



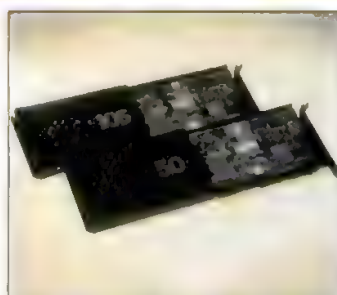
Spinrite II 2.0

(Gibson) Spinrite II 2.0 identifies, diagnoses and repairs every form of data and low-level format damage on standard DOS hard disks. Eliminates common DOS errors and optimizes system's sector interleaving to deliver optimum hard disk data transfer rates. Detects disk surface flaws, moves endangered data to safety and much more. **UT0874 \$59.**



QEMM 386 5.1

(Quarterdeck) New and enhanced! Gain up to 200K or more of previously unusable memory. New features include Stealth, which diverts system ROM into other areas, giving you much more memory. QEMM will also manage EMS, EEMS or extended memory, and includes automatic memory conversion, full compatibility with Windows and speed optimization of memory. Includes free Manifest, the award-winning diagnostic tool. **EX1103/5 \$61.**



HardCard II XL105 MB

(Plus Development) Plug in a HardCard II XL disk drive and boost the performance of your 286 and 386 based PC. These hard disks on a card work alongside your other drives, and offer a 9ms effective access time, with a 1400 KB per second sustained transfer rate. Ideal for the new disk-intensive user interfaces and applications. Comes with a manufacturer's two year warranty. **DR1880 \$575. Also available: HardCard II XL50. DR1890 \$399.**

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GR2134	★ PictureEze 1.0	99.
BS0204	★ Pizazz Plus 2.0	65.
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	★ Image Portfolio (various)	85.
Atach		
GR2763/5	★ Pub. Powerpak for Windows	55.
GR2773/5	★ Pub. Powerpak for WordPerfect	55.
Berkeley Systems		
GR1994	★ After Dark	35.
Broderbund		
GR1564	New Printshop	35.
GR0064	New Printshop Companion	29.
Caere Corporation		
GR1984	★ Omnipage 386 3.0	479.
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GR2114	WordScan+	669.
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GR1823	★ CA Cricket Graph 1.3	85.
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GR1854	★ Intermision	32.
Micrografix		
GR1773/5	★ Charisma	344.
GR2783/5	★ Designer 3.1	485.
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New Visions Technology		
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Software Publishing		
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GR0634	PC Paintbrush IV Plus	119.
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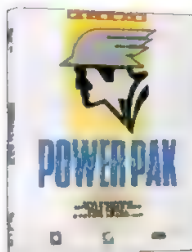
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MM0860 Call.



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hDC Computer Corp.
UT1944 FileApps 75.
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UT0644 Windows Express 3.0 55.

Helix

BS3154 NetRoom Single User 2.0 49.
BS3134 NetRoom 4 User 91.

Hewlett Packard

BS2783/5 New Wave 3.0 for Windows 109.

Informix

BS2283/5 Wingz for Windows and OS/2 325.

Insight Resource

BS3423/5 Ko-Pilot for Lotus 1-2-3 59.
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BS3973 Lotus Graph Writer II 335.
BS2654 Lotus Works 1.0 95.
BS2323/5 Symphony 2.2 515.

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UT0844 AutoMenu 4.7 38.

mBAllen

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Meca

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Merrill & Bryan Enterprises

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UT2034 Remote Rx 69.
UT1654 Turbo EMS 6.0 56.

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Que Software

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Reality Technologies

FN0124 Wealthbuilder 1.1 139.

FN0334 WealthStarter 1.0 35.

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WP0514 Grammatik Windows 55.

Sea, Inc.

UT2114 Arc+Plus 7.12 49.

SitBack Technologies

BS3554 SitBack for Windows 79.

Softlogic Solutions

UT0073/5 Disk Optim. Tools w/ Data Guard 35.

Software Directions

UT1914 Print Q 5.0 85.

UT0884 PrintQ LAN 285.

Software Products International

BS2864 Access SQL Multi User 949.

BS2873/5 Open Access III 425.

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WP1523/5 Professional Write Plus 169.

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CM0314 MicroPhone II for Windows 215.

Spinnaker Software

BS1923/5 BetterWorking Eight-In-One 32.

BS1134 The Resume Kit 29.

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WP1573/5 Just Write 1.0 129.

UT2154 Norton AntiVirus 1.5 85.

UT0054 Norton Util. Advanced 6.0 115.

UT2153 Norton Backup Windows/DOS 85.

BS4013/5 Q&A 4.0 235.

BS3723/5 On Target 1.0 255.

Teleware

FN0414 M.Y.O.B. 135.

Timeslips Corp.

BS0133/5 Timeslips III 4.0 189.

Touchstone

UT0734 Check It! 3.0 85.

Traveling Software

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UT2014 WinConnect 1.0 65.

Vertisoft

UT0904 Double Disk 62.

WestCliff Software

WP1504 DosAmigos 99.

WordPerfect Corp.

WP0363/5 WordPerfect 5.1 249.

WP0504 LetterPerfect 1.0 129.

WordScience

WP0483/5 Definitions Plus 65.

WordStar U.S.A.

WP1604 Correct Grammar for Windows 59.

WP0634 WordStar Legacy 269.

XTree Company

UT1874 XTree Gold 2.0 92.

LANGUAGES

Asymetrix

LN1454 Toolkit 289.

Borland International

LN1654 Borland C++ 2.0 Prol. 335.

LN1664 Object Vision for Windows 95.

Microsoft

LN0074 C Compiler 6.0 315.

LN0043/5 QuickC 2.5 65.

LN1674 Visual Basic 129.

Nantucket

LN1444 Clipper 5.1 510.

Solution Systems

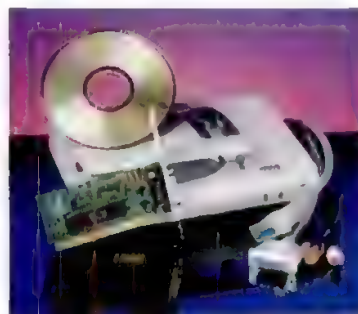
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Spinnaker Software

LN1464 Spinnaker Plus 269.

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CONNECTIVITY
SECURE LAN WORKSTATIONS

should be available before this review is printed.

The RPM3/E offers a reasonable choice in the diskless workstation market. It is not as small, secure, inexpensive, or full-fea-

The TS5 TeleStation takes a draconian approach. You can't use a floppy disk drive, even if you install one. The BIOS is designed to prevent it.

TELEVIDEO SYSTEMS INC.

TeleVideo TS5 TeleStation



The TeleVideo TS5 TeleStation.

tured as some of its competitors, but it does provide a good combination of these factors. The emulated floppy disk drive is a plus, but it may not be enough to win out over some of the other alternatives.

The TeleVideo TS5 TeleStation takes a different approach to security from any of the other workstations reviewed here. The

system carries a list price of \$1,625 for the base model with a 16-MHz 386SX and 1MB of memory. Our \$2,727 tested configuration included 4MB of memory, on-board VGA, a Samtron 14-inch color VGA monitor, and a 16-bit Omti TE200 Ethernet adapter.

The system comes in a typical slimline desktop case, complete with knockout panels in the front for the two drive bays inside the chassis. Other workstations in this review have the capability to accept floppy disk drives but include some security system to control their use. The TS5 TeleStation takes a more draconian approach: You can't use a floppy disk drive, even if you install one. The BIOS is designed to prevent the computer from recognizing a floppy disk drive, no matter what you set in the CMOS configuration program. We tested this aspect carefully, since the computer would not qualify for this review if this feature did not work.

ADD ONE BOARD

Inside the case, a custom motherboard with a passive expansion bus extension provides three 16-bit ISA bus slots. Since the VGA adapter circuitry and the one par-

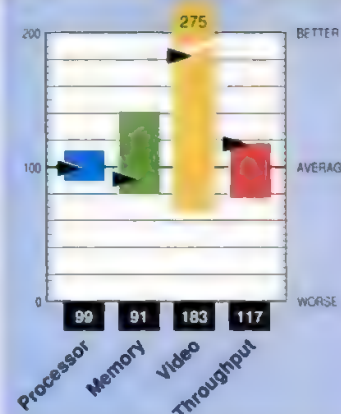


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CONNECTIVITY: SECURE LAN WORKSTATIONS

TeleVideo TS5 TeleStation

TEST RESULTS



In Short: TeleVideo Systems' 16MHz TS5 TeleStation offers average performance times; its good throughput test score stands out. It has little in the way of security features, aside from its built-in inability to recognize a floppy disk drive. The system is also marred by poor and at times questionable documentation.

allel and two serial I/O ports are integrated on the motherboard, only one slot is needed for the network-interface board. The Omti Ethernet board that came with the tested unit includes connectors for AUI and coaxial cabling.

There are no true security features in this unit aside from the floppy-blind BIOS, although one feature allows you to disable the motherboard I/O ports. But since the case lacks a physical lock of any sort, it has nothing to prevent a user from simply opening up the workstation and resetting the switches.

QUESTIONABLE MANUAL

There is practically no difference between installing a TS5 TeleStation and a stand-alone PC, assuming you are using a network card with remote-boot PROMs. The user manual is not a great source of information or assistance, however. It includes a table of contents, but no index, making it difficult to find the information you need. Once you find it, it may turn out to be of questionable value, as evidenced by some incorrect information we found for options



FACT FILE

TeleVideo TS5 TeleStation

TeleVideo Systems Inc., 550 E. Brokaw Road, San Jose, CA 95161; 408-954-8333

List price (tested configuration): \$2,727.

Memory: 4MB 80-ns. SIMMs.

Display: Integrated Paradise Systems VGA with 256K video RAM, Samtron 14-inch monitor.

LAN adapter: 16-bit SMS Technologies OMTI TE200 Ethernet interface.

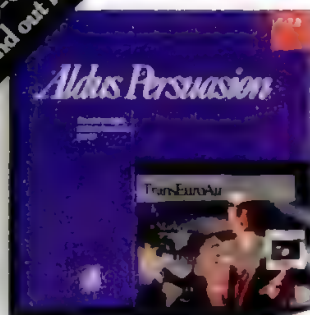
Software: DOS 3.3.

CIRCLE 646 ON READER SERVICE CARD

such as halting programs. But if the documentation stumps you, you can get free technical support over the phone from TeleVideo at a toll number from 8:30 to 7:30 C.S.T.

The TS5 TeleStation executed the PC Magazine Labs benchmark tests with mostly average times for a 16-MHz 386SX system, although its scores on the Workstation Throughput Evaluation test were at the top. But for the security offered by this unit, you would do almost as well buying a

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INFORMATION SYSTEMS

CIRCLE 525 ON READER SERVICE CARD

CONNECTIVITY

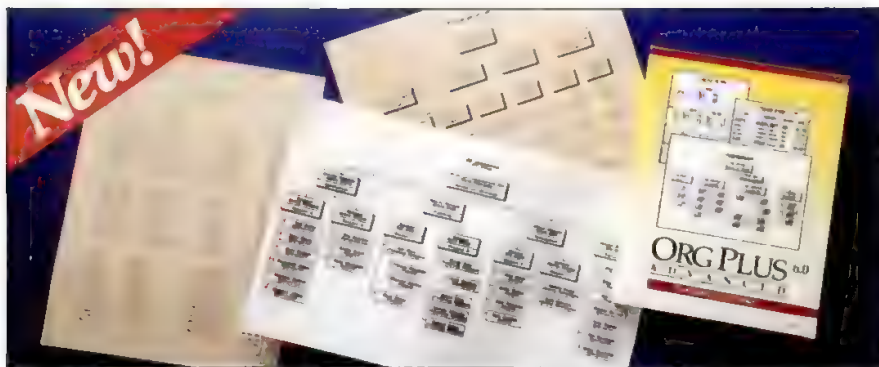
SECURE LAN WORKSTATIONS

standalone PC with a solid case lock, and simply configuring it without a floppy disk drive. The TS5 TeleStation just does not stand up against the competition in this market.

UNISYS CORP.

Unisys PW² LAN Workstation/386SX

Okay, time for a puzzle: find the computer in this picture. There's the monitor, and there's the keyboard, but where's the computer? If you look closely at the back of the Unisys PW² LAN Workstation/386SX, you'll find an extra 2-inch-thick slice of plastic, steel, and electronics clinging to the back of the monitor case. That's the computer.



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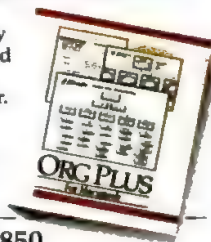
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System requirements: IBM PC, XT, AT, PS/2 or compatibles, a hard disk, 512K of RAM, and DOS 3.0 or higher. Works with all monitors and printers. Macintosh version requires a Macintosh Plus or higher, 1 MB of RAM, 2 floppy disk drives, or 1 floppy disk drive and a hard disk. Org Plus is a registered trademark of Banner Blue Software Incorporated. Other brands and products are trademarks of their respective holders. © Copyright 1991 Banner Blue Software Incorporated. All rights reserved.

CIRCLE 351 ON READER SERVICE CARD

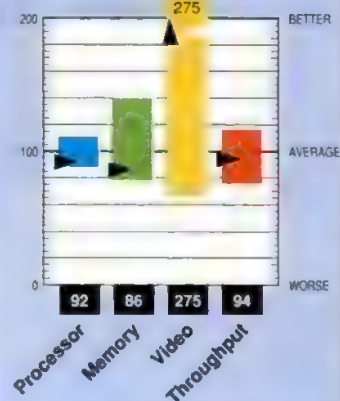
Although it's no bigger than a half-ream of copy-machine paper, the PW² contains a 16-MHz 386SX computer with integrated VGA, I/O ports, and propri-

The Unisys PW² LAN Workstation/386SX's computer is the extra 2-inch-thick slice of plastic, steel, and electronics clinging to the back of the monitor case.

etary network interface. A base model with 2MB memory and an Ethernet interface costs \$2,395. Omnet and Token-Ring versions are also available for \$200 more. Our evaluation model came with 4MB RAM, a color VGA monitor, and a

Unisys PW² LAN Workstation/386SX

▶ TEST RESULTS



In Short: The 16-MHz PW² LAN Workstation/386SX achieved test scores in line with other systems in its class; it excelled on the video test, but its throughput test score could be improved. Its space-saving design and competitive pricing are attractive but offset by restrictive support policies and no security features beyond a truly diskless format.

Software Carousel 5 instead of DOS 5?

Don't get us wrong. We like the new DOS 5. It has vastly reduced memory requirements.

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Sure, DOS 5 does let you switch from one program to another without saving, exiting, and loading a new program. But Software Carousel does it with the kind of speed and ease that makes it worth doing.

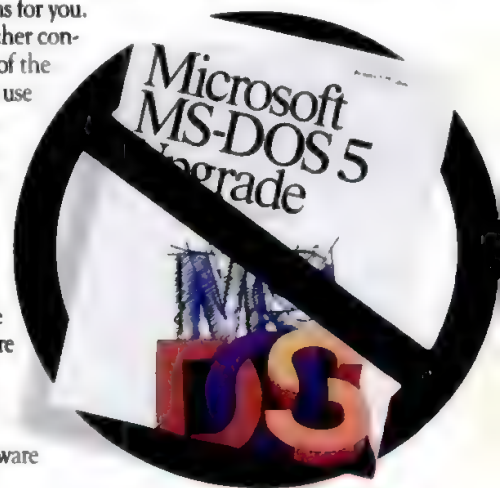
For example, DOS 5 has to use your hard disk to store "switched away" programs, so it can take some time moving among applications. Since Software Carousel automatically makes full use of extended

and expanded RAM to store idle programs, it can switch in the blink of an eye.

DOS 5 makes you specify each program you want to run, every time you start your computer. Software Carousel *automatically* starts your favorite programs for you.

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And that's just the beginning. So if you're considering DOS 5 for its task switching abilities, maybe you should consider Software Carousel, instead.



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Actually, there's no need to choose between Software Carousel and DOS 5. In fact, they work rather well together.

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feature that lets you transfer data among all kinds of applications you use today. Both features are easy to turn on, and easy to use.

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Of course, you don't need DOS 5 to use Software Carousel. But if you have DOS 5, and really want to get the most out of it, Software Carousel is the answer.

Software Carousel \$89⁹⁵

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SOFTLOGIC SOLUTIONS

CONNECTIVITY SECURE LAN WORKSTATIONS



Unisys's PW² LAN Workstation/386SX.

no room for a floppy disk drive, even if you want to add one. Your network system must provide any other security measures; users are bound to encounter them, since the only way to boot the workstation is through the remote-boot PROM on the network interface.

A serial port, a parallel port, and a mouse port have connectors on the back of the case. The mouse port is of particular interest since the PW² comes with *Microsoft Windows 3.0*. You can add only a few options to the system: there is room for a math coprocessor and a total of 8MB RAM (using 1MB SIMMs).

built-in 8-bit Ethernet interface, for a total price of \$3,425. The color monitor accounts for \$675; you can save more than half of that by opting for a \$305 monochrome VGA display instead.

MINIMUM DESKTOP SPACE

The main attraction of the PW² is the minimal amount of precious desktop real estate it occupies. But the only security feature is the truly diskless design. The case leaves

CONDITIONAL TECH SUPPORT

Installation is fairly easy. A well-written, well-illustrated set of manuals guides you through the various steps. Technical support is available, although it varies with where you buy the unit. If you purchase it directly from Unisys Corp., you have access to free support at a toll-free number from 8:00 to 5:00 E.S.T. while the product is under warranty. After that, you purchase an additional service contract. If you buy



FACT FILE

Unisys PW² LAN Workstation/386SX

Unisys Corp., Township Line and Union Meeting Roads, Blue Bell, PA 19424-0001; 800-448-1424, 215-986-4011.

List price (tested configuration): \$3,425.

Memory: 4MB 80-ns. SIMMs.

Display: Western Digital VGA adapter with 256K video RAM, built-in 14-inch monitor.

LAN adapter: Proprietary 8-bit Ethernet interface.

Software: DOS 4.01, *Microsoft Windows 3.0*, expanded memory manager.

CIRCLE 647 ON READER SERVICE CARD

the unit from an authorized VAR or other reseller, that person is responsible for providing support and you will not have direct access to Unisys specialists.

The PW² generally performed as expected for a 386SX system, although its scores on the Workstation Throughput Evaluation test were the lowest of any machine we reviewed.

Considering the features the system includes, the package's price is palatable. Although the only security is the lack of a floppy disk drive, the small footprint and the convenient setup are enticing features. If you do not need the full-blown security that other systems offer, the PW² might be an appealing and tidy solution.

LOOKING FOR



U-TRON TECHNOLOGIES INC.

U-tron 386SX Purple Diskfree Workstation



U-tron's 386SX Purple Diskfree Workstation.

CONNECTIVITY SECURE LAN WORKSTATIONS

A regal purple band graces U-tron Technologies' U-tron 386SX Purple Diskfree Workstation. The base model, essentially a bare-bones system with 1MB RAM, carries a modest \$870 list price. By the time you upgrade it to 4MB memory, a Supertronic 14-inch color Super VGA monitor, a VRAM Super VGA video adapter, and a 16-bit D-Link Ethernet network adapter with remote-boot PROM, the list price advances to a heftier \$2,335. Despite strong support and warranty policies, the workstation is limited in design, security, and documentation.

Inside the 3.2-inch-tall case, the U-tron motherboard is a typical clone design. It includes two 8-bit and six 16-bit slots, but given the lack of headroom, none are usable. Instead, a passive bus extender rises from a middle slot with room on either side for expansion cards: two 16-bit slots to the left and one to the right.

SLOTS IN USE

Unlike most other designs in this group, however, the Purple Workstation relies on minimal integration on the motherboard. As a result, in a typical configuration all three expansion slots are filled with the network adapter, the video adapter, and an

Unlike most designs in this group, the Purple Workstation relies on minimal integration on the motherboard. In a typical configuration, all three expansion slots are filled.

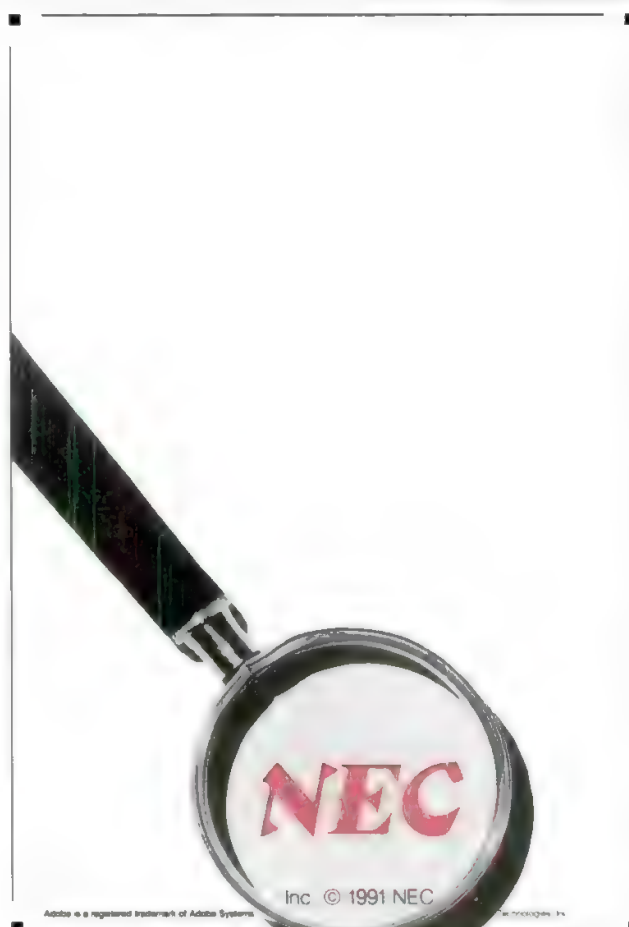
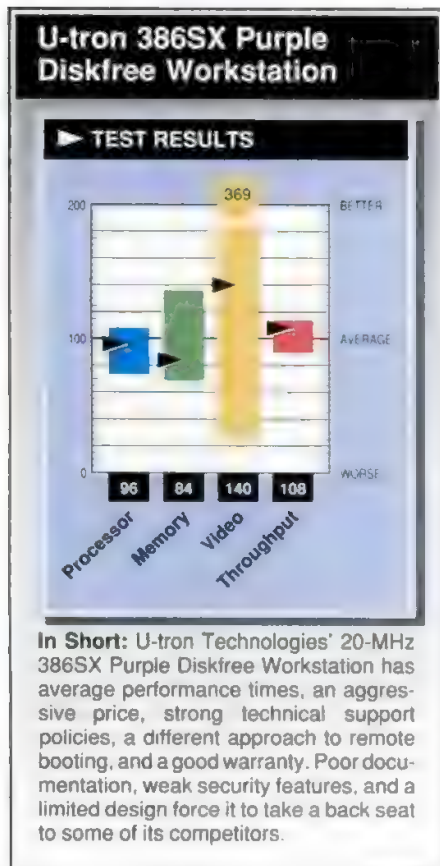
I/O card with two serial ports, a parallel port, and a mouse port. The motherboard will accept up to 8MB of memory (using 1MB SIMMs).

The manual is attractively illustrated and well-written, but has serious flaws. The illustration of the expansion card posi-

tions did not match our test unit, and the motherboard described was decidedly different from the one in our case.

If you use the Purple Workstation with the network adapter supplied by U-tron, you can take advantage of special remote-boot software. Using the Boot Manager program, you can set up any network workstation as a Boot Server for Purple Workstation users. No fooling with the file server or DOSGEN. The Boot Manager runs as a TSR in the background, so the workstation can be used for other applications at the same time. The system acting as the boot server must have a hard disk, since each user's boot image requires 1.2MB of storage; when the program runs, it uses 96K of RAM on the boot server. This system offers some advantages over standard network remote-boot procedures, since it can be easier to set up and maintain different boot images for different individuals and groups of users.

Once you get the system installed and operating, it turns in performance times typical of a 20-MHz 386SX processor. The D-Link card in the evaluation unit provided notably good performance on the Workstation Throughput Evaluation test.



CONNECTIVITY
SECURE LAN WORKSTATIONS

The system offers little security, aside from the absence of an opening on the case for a floppy disk drive. The system does include a drive bay, but in the standard configuration, it has no slots free for a controller. Although we did not receive it in the test configuration, U-tron offers an optional I/O card that includes a floppy/hard disk controller.

Security also comes in the form of a password feature in the BIOS. The pass-

word feature, however, was not documented in the manual.

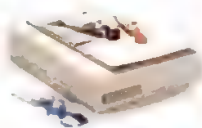
LIBERAL SUPPORT POLICY

If you need assistance, free technical support is available through a toll-free line for as long as you own the workstation. The hours are 9:00 to 5:00 P.S.T., which means that easterners will have to wait un-

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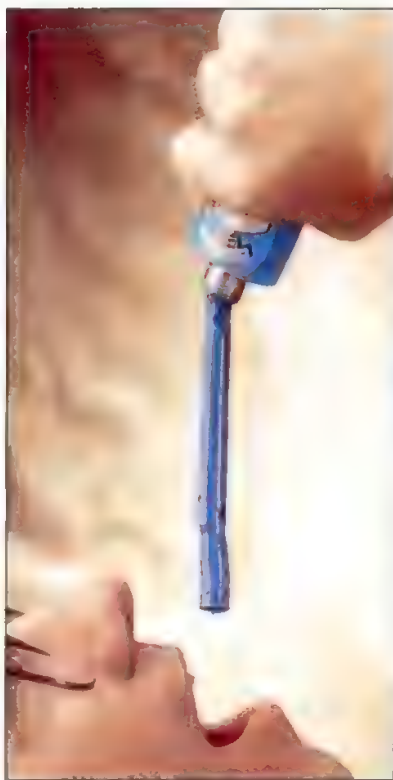
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FACT FILE

U-tron 386SX Purple Diskfree Workstation
U-tron Technologies Inc., 47381 Bayside Pkwy., Fremont, CA 94538; 800-933-7775, 415-656-3600.
List price (tested configuration): \$2,335.
Memory: 4MB 80-ns. SIMMs.
Display: Headlands VRAM II Super VGA adapter with 1MB RAM; Supertron 14-inch monitor.
LAN adapter: 16-bit D-Link Systems Ethernet interface.
Software: Expanded memory manager.

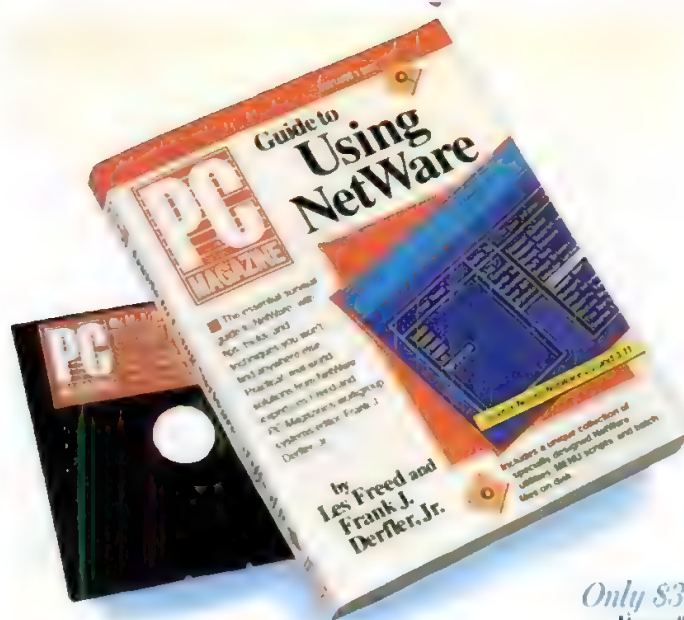
CIRCLE 648 ON READER SERVICE CARD

til the afternoon to get questions answered. But the support policy is much more liberal than the ones that some competitors provide for systems that are much costlier. U-tron includes on-site TRW repair service

Not much stands out about the Purple Workstation aside from its unusual moniker and remote-boot software. It is very similar to a standalone slimline PC but has no opening for a floppy.

and 48-hour swap programs in its one-year parts-and-labor warranty.

Not much stands out about the Purple Workstation aside from its unusual moniker and remote-boot software. It is very similar to a standalone slimline PC, but its case has no opening for a floppy disk drive. Although the support policy, warranty, and price are attractive, the value is diminished by poor documentation, a lack of expansion alternatives (in spite of the presence of expansion bus slots), and no extraordinary security features. None of these flaws are fatal, but taken together they make the Purple Workstation's value less than that of some alternatives. ■



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Data compression utilities aren't just for modem users trying to cut the cost of their phone bills. Any one of these six inexpensive programs can help you reclaim megabytes of hard disk space.

by Barry Simon

General-purpose data-compression utilities stem from the need for faster and cheaper ways to transfer data from bulletin board systems, but they have also become important tools for managing your hard disk space. These programs can save you megabytes of valuable hard disk real estate by storing rarely accessed files in a tightly compressed format. In this evaluation, we look at six programs, with prices ranging from free to \$89.95, that compress multiple files into a single archive: *ARC Plus*, *ARJ*, *Hyper*, *LHA*,

PAK, and PKZIP.

Suppose you have a 3MB directory of six-month-old correspondence written in *Microsoft Word*. To clear space on your hard disk, you're about to copy all those letters onto nine floppy disks, even though you're thinking, "I'll bet I won't be able to find this stuff when I need it!" Then you remember that copy of *PKZIP* you picked up. You type in

```
PKZIP -m oldltr *.doc
```

and 2 minutes later you've got a single 1MB file called OLDLTR.ZIP, which has that 3MB of data tucked inside. If you want to spend the time, you can even assign a comment to each file to help you find the right one if you ever go back to look for something. In a few weeks, if you

need one of those files, you can use *PKZIP* to get a directory of the contents of OLDLTR.ZIP and selectively recover the originals of some of the files you zipped into storage.

Before data compression utilities emerged, there were programs with names like *LUE* that made libraries of related files but didn't compress them, and also compression programs, notably *SQ* and *NUSQ*, that compressed both single files and libraries. With a plethora of compression combinations available—libraries of squeezed files, squeezed libraries—considerable confusion ensued.

In 1985, a small shareware company, System Enhancement Associates (now SEA International), cut through the con-

fusion by releasing *ARC*. *ARC* combined library and compression functions and had the ability to try several different compression strategies before choosing the best one for each file. The program rapidly became a standard.

Then a programmer named Phil Katz entered the picture. Katz wrote two shareware programs called *PKARC* and *PKXARC*, a compression/decompression pair that could read and write the format of SEA's *ARC* three to ten times as fast. The two programs were soon being used by other software vendors to compress the data on their program distribution disks.

In 1988, SEA sued PKWare, Katz's company, alleging trademark and copyright infringement, code copying, and unfair business practices. Katz signed a decree admitting no fault but agreeing to

PUTTING A FRIENDLY FACE ON DATA COMPRESSION

by Barry Simon

General-purpose file-compression utilities usually come with rather spare command-line syntaxes, but just as there are DOS shells like *XTree Pro Gold* to put a friendlier face on DOS, there are also specialized programs to make dealing with compressed archives easier.

ArcMaster, *Shez*, and *Zip Manager* are archive shells that handle .ARC, .LHA and .ZIP files. They do not replace *ARC Plus*, *LHA*, and *PKZIP*; in fact, they require you to have at least one of these programs, and they operate by calling the right program with the proper command-line switches.

ArcMaster and *Shez* are run from DOS and display directory trees and file directory lists. You can mark several files and ask the programs to place them in a .ZIP or .LHA archive. When you already have an archive, the programs display its internal directory and allow you to mark files for unarchiving. Or they will extract files to DOS's standard output and link to a program like *List* to view those files. They can even look inside archives to which SFX modules have been added for automatic decompression.

If you use *Microsoft Windows*, you might want to consider using *Zip Manager*, which provides similar func-

tionality under *Windows*. If you use only the .ZIP format, *WinZip* is an additional choice.

Another interesting alternative for .ZIP users is Lotus Development Corp.'s *Magellan*, a hard disk manager and text retrieval package. Lotus has licensed *PKZIP* code and put it into *Magellan*. The software can compress and decompress files in .ZIP format, but it also has dozens of file viewers that let you look inside your files, whether they are compressed or not. The viewers cover all kinds of data, including several spreadsheet, database, word processing, and graphics formats. ■

ArcMaster, Version 5.56

New-Ware, 8050 Camino Kiosco, San Diego, CA 92122; 619-450-3257.

List Price: \$35 (shareware); also available on PC MagNet's Utilforum, section 16, as ARCMST.ZIP.

Requires: 370K RAM, at least one file compression utility, DOS 2.0 or later.

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Magellan, Version 2.0

Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 617-577-8500.

List Price: \$139.

Requires: 512K RAM, DOS 2.1 or later.

CIRCLE 403 ON READER SERVICE CARD

Shez, Version 6.1

California Software Design, P.O. Box 15248, Santa Rosa, CA 95402; no telephone listing.

List Price: \$30 (shareware); also available on PC MagNet's Utilforum, section 16, as SHEZ.ZIP.

Requires: 300K RAM, DOS 2.1 or later.

CIRCLE 404 ON READER SERVICE CARD

WinZip, Version 1.00

Nico Mak, P.O. Box 919, Bristol, CT 06011; 800-242-4775. **List Price:** \$29 (shareware); also available on PC MagNet's Utilforum, section 16, as WINZIP.ZIP.

Requires: 1MB RAM, DOS 3.0 or later, *Microsoft Windows* 3.0.

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Zip Manager, Version 3.0

Moon Valley Software Inc., 107 E. Paradise Ln., Phoenix, AZ 85022; 602-375-9502.

List Price: \$21.95 (shareware); also available on PC MagNet's Utilforum, section 16, as ZIPMGR.ZIP.

Requires: 100K RAM, DOS 3.0 or later, *Microsoft Windows* 3.0.

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2450MNP	INT	-	✓	4800	-	\$189
MB2400EX	EXT	-	opt.	4800	-	\$199
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MB2296F	INT	-	✓	4800	9600	\$199
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UTILITIES

DATA COMPRESSION



EDITORS' CHOICE

■ LHA

All six data compression utilities do a satisfactory job of compression, but Haruyasu Yoshizaki's *LHA*, Version 2.12, does the best job. While the compression performance results of these programs fall within a 10 percent range, that 10 percent can become meaningful when you're dealing with many megabytes of data. *LHA* and *ARJ*, Version 2.0, usually fell within 1 percent of each other on our compression size tests, with *LHA* proving slightly more effective on graphics files and *ARJ* prevailing on text and .DBF files.

LHA gets the nod over *ARJ* because the header it attaches to its self-extracting modules is both the smallest among the six programs (at 1.9K) and the one with the most potential for customization. Using the self-extracting technique lets you send compressed files to a person who won't need any utility to decompress them. Best of all, *LHA* is free, with only minor limitations put on your ability to distribute it.

PKZIP, Version 1.1 (\$47), took last place in shrinking files, but it was the leader in compression and decompression speeds. Keep in mind that the .ZIP format is the current standard in data compression—something to remember if you download anything from BBS (or from PC MagNet). If you send or receive any compressed data at all, don't use self-extracting modules; chances are you'll need a tool that handles the .ZIP format, be it *PKZIP*, *PAK*, or *Magellan*.

So while this Editors' Choice goes to *LHA* for its technical prowess, remember that if you're going to use only one of these programs, it should be *PKZIP*. But at these prices, why not get *LHA* as well?

stop using the name ARC, to stop producing ARC-compatible compression programs by the end of January 1989, and to pay damages.

Nevertheless, when Katz's program, now called *PKZIP*, first arrived in late 1988, numerous BBS systems switched from .ARC to .ZIP overnight, and within a year, the .ZIP format was the new standard. It remains so today.

In March 1989, Japanese mathematician Haruyasu Yoshizaki posted a program called *LHARC* on GENie. Just as *PKZIP* was typically about 10 percent better than the old ARC on compression size, *LHARC* was about 10 percent better than *PKZIP*. The gauntlet thrown down, Katz went back to his programming and came close to matching *LHARC*. Within six months, the state of the art went from roughly 2.5:1 compression on text files to 3:1.

OTHER STRATEGIES

These general-purpose programs are not the only products that shrink files. The accompanying chart "Data Compression Alternatives" outlines other data compression strategies and the advantages and disadvantages of each method. For example, there is a class of programs including *Cubit* (SoftLogic Solutions, One Perimeter Rd., Manchester, NH 03103; 800-272-9900; \$49.95) that will compress files in the background.

Several other programs compress entire partitions of files using device drivers or boot manipulation, and they do it automatically. Products include *Expandz* (InfoChip Systems, 2840 San Tomas Expressway, Santa Clara, CA 95051; 408-787-0541; \$199 for software and board), *Stacker* (Stac Electronics, 5993 Avenida Encinas, Carlsbad, CA 92008; 800-522-7822, 619-431-7474; \$229 for software and board, \$149 for software only), and *SuperStor* (AddStor Inc., 3905 Bohannon Dr., Menlo Park, CA 94025; 800-732-3133, 415-688-0470; \$119.95).

There are also file-specific background compression products. *SQZ* (Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014; 408-253-9600; \$99) compresses *Lotus 1-2-3* worksheets, and *FontSpace* (Isogen, 330 Seventh Ave., New York, NY 10001; \$89.95) deals with HP LaserJet fonts. You might expect that they'd do better than the general compression programs since they're optimized for the structure of the files they deal with, but some experimentation with *SQZ* showed

that the package compressed 1.2MB of worksheets to 287K (76 percent compression) while *PKZIP* squeezed the data down to 237K (80 percent). The real advantage of these programs is that they'll work transparently in the background, *SQZ* via a *Lotus 1-2-3* add-in, *FontSpace* via a TSR that intercepts the print stream and decompresses on the fly.

Backup software like *Fastback Plus* and *The Norton Backup* also compresses data when it backs it up onto floppy disks, but to its own proprietary format.

Graphics users will need to give some thought to using compression programs together with compressed graphics formats like .GIF and compressed TIFFs. Our tests show that you gain nothing by using one of these compression programs on compressed .GIF files or on gray-scale TIFFs, but if saving disk space is your sole criterion, you can have success by translating the .GIFs and TIFFs to .PCX format and then using a compression utility to shrink the .PCX files. The tradeoff is space versus convenience: You'll have to decompress the .PCXs manually before your paint program will understand them, while a compressed TIFF file will be directly readable.

OVER THE WIRE

How do you send a compressed file to someone who doesn't have the decompression module or program? You can send him the package (five of these programs are shareware), but it's more efficient to add a special header to the file that makes it executable. When you run the .EXE, it decompresses the files and stores them to disk. These self-extracting files, which add a file overhead of up to 16K, are called SFXs, and all six of the utilities evaluated here can create them.

Users whose modems support MNP level 5 compression will need to pay attention to its links with general-purpose compression programs. We did a series of three test transfers with Microcom modems at 2,400 bits per second with each of the 15 sample files:

- uncompressed files with MNP 5 on;
- .ZIP files with MNP on;
- .ZIP files with MNP off;

The most efficient times were for .ZIP files with MNP turned off, showing that it's better to use a compression utility like *PKZIP* than to use MNP compression when transmitting data. For the 15 file types we tested, downloading files compressed by MNP5 alone took 24 percent



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"The ZEOS Notebook... a clear winner...why settle for less?" — **Byte** ■

"This notebook is a steal." — **InfoWorld** ■ *"The ZEOS beats the Compaq."* — **PC Computing**

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outstanding value." — **PC Week**

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Either way, you're sure to appreciate our light weight snap-in, snap-out battery packs. They're so light and easy to use, you can easily take an extra one with you on those really long trips. You can get even more life out of a single charge by using our programmable power management system. Hour upon hour of Notebook computing power!

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Your new ZEOS notebook is a great connectivity tool. Utilizing our optional built-in 2400 baud MNP Class 5 modem,

connectivity buffs will find themselves logging on at every turn. And speaking of connectivity, we've kept the I/O easy to use too. Because unlike many of the others, your new ZEOS notebook has the same industry standard port connectors you'll find on your larger desktop system. Completely compatible! Serial and Parallel ports; even an external VGA connector. All industry standard and ready to go the minute you receive your system.

It's attention to detail that makes the difference. Tens of thousands of hours of development time have been invested. We've been thinking and re-thinking exactly what you want in a notebook, and now we're building it for you. We think you'll agree, it's an incredible product. Plus, your new notebook is backed by the best support in the industry, 24 Hours a Day.

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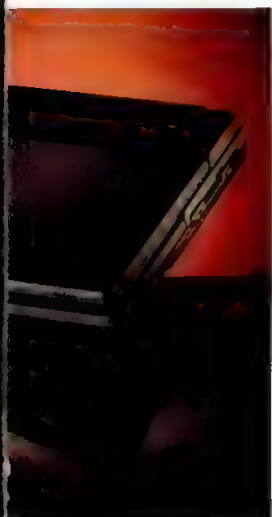
Your new notebook is also backed by our 30 Day Absolute Satisfaction Money Back Guarantee and One Full Year Limited Warranty. You're going to be very satisfied. We don't just say it. *We Guarantee It.*

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You can order your new ZEOS notebook *right now*. Simply pick up the phone and give us a call at 800-423-5891. And don't forget the extra goodies. Like larger hard drives, carrying cases, and extra batteries. All these are available now in money saving packages. You're going to love your ZEOS notebook. That's a guarantee!

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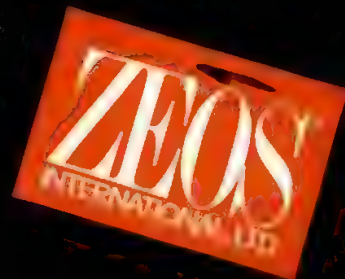
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- 82 key keyboard. True 101 key emulation.
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The ZEOS Guide to the Perfect Notebook:

 **PROCESSOR:** PC Magazine recommends a '386SX processor pointing out that, "Finally, we've got portable PCs capable enough to be your *only* PC." That's why ZEOS offers you a 16MHz or a 20MHz '386SX! More power for you. After all it's just like a take-anywhere desktop!

 **DRIVES:** *Two drives, built in!* A whisper quiet high speed 20 Megabyte or larger hard disk *plus* a 1.44 Megabyte 3.5 inch floppy. Remember, with a built in floppy drive you don't need to fool around with strange interfaces to load and transfer files.

 **VIDEO:** ZEOS raises the ante to VGA! We're talking about bright and crisp VGA displayed on one of the largest notebook screens in the industry. The display also features advanced fluorescent backlighting, 32 grey scales and 640 x 480 resolution. Plus, it can be adjusted to any position over a 135° angle and features easily adjustable brightness and contrast controls. Easy viewing under virtually any lighting conditions. You can connect to an external VGA color monitor too!

 **GREAT BATTERY FEATURES:** Every battery feature you want. You can plug your notebook in and "quick charge" the battery in less than one hour or you can "trickle charge" while in use. Plus, your battery easily snaps out allowing the quick installation of an optional replacement battery. It's great to be able to carry a light weight spare for those especially long trips. An optional battery charger stand is available as well.

 **INTELLIGENT POWER MANAGEMENT:** Your new ZEOS notebook features an intelligent programmable power management system if you wish to use it. Based on the length of time since your last keystroke, you may reduce CPU speed, display screen backlighting etc. Full power is immediately restored at the stroke of any key. The system even knows *not* to use the power management system when you are operating on AC power!

 **SYSTEMS STATUS AT A GLANCE:** Yes, monitor eight key system components at a glance! We've equipped your new notebook with eight LED indicators which monitor disk access, keyboard functions and power status. There is even an audible alarm

which may be programmed to inform you of a low battery condition and to let you know if the cover is closed with the power on. Now that's one smart notebook!

 **DESKTOP KEYBOARD FEATURES:** We're talking 82 full size keys with full 101-key emulation. And the keyboard isn't squeezed either. The distance between the "Q" key and the "[" (left bracket) key measures 7.5 inches, just as PC Magazine suggests. The keys are of standard size, plus touch typists will love our full 3.5mm keystroke. Type for hours and love it!

 **CONNECTIVITY AND I/O:** Keeping in touch is easy when you order our internal 2400 baud MNP Class 5 modem. Simply plug in the phone line and dial away. How about I/O ports? Many notebooks don't have them and if they do they're often non-standard. But your ZEOS notebook has *industry standard* I/O—serial, parallel and VGA. Just like your desktop!

 **FCC & UL APPROVALS:** Your new ZEOS notebook features both FCC Class B and UL approvals. We've also met CSA and VDE requirements too, just for good measure. Quality and reliability.

 **WATCH THE DETAILS TOO:** Like memory expandability. One Meg comes standard, you can also order a total of 3 or 5MB as a factory option. And lots of other details. Like a recessed power-on reset button, a soft carrying handle, built in speaker and more. You're going to love it! And there's no reason to wait.

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CHECK IT OUT!

Now, you can take desktop computing power anywhere! Your ZEOS notebook has many features of obvious importance. Also, there are a number of features that are subtle yet critical to your ultimate satisfaction. We'll go over them here one by one. We think you'll agree your new ZEOS Notebook is the one for you!

Your New ZEOS Notebook.
Take your pick!

16 MHz '386SX
Only \$1995!

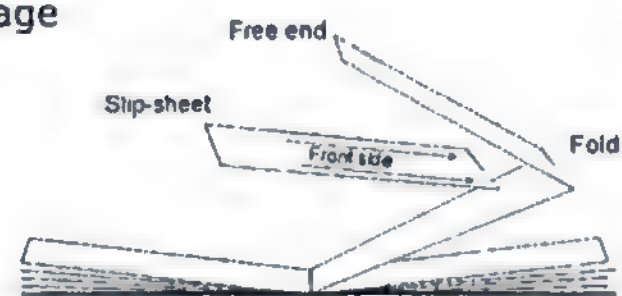
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1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet



Inverted Foldout slip-sheet

Folded edge of the page

1. Open the foldout page

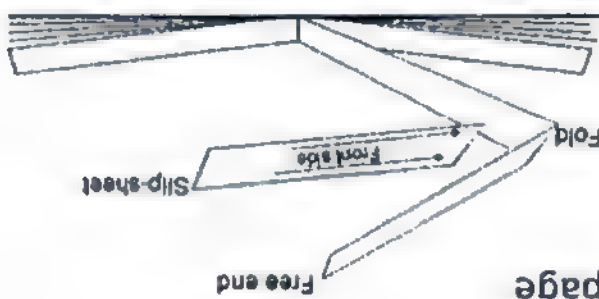
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

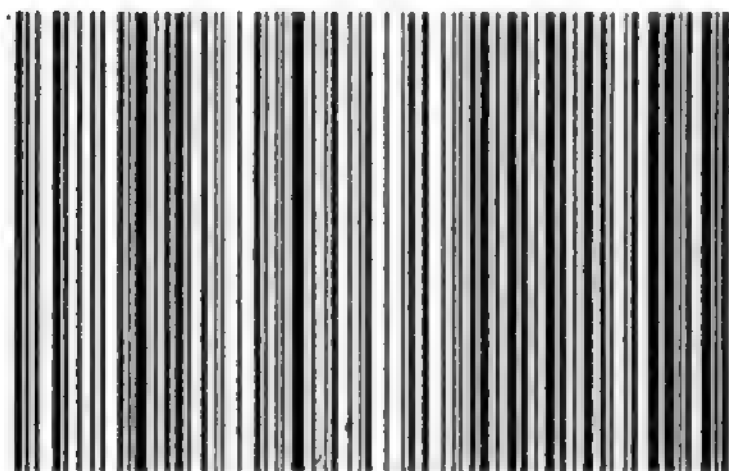
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1. Follow instructions on the other side

Inverted Back



Gbs5lipBack-001B

Back

1. Follow instructions on the other side



**"THE HOTTEST DEAL
ON THE NOTEBOOK
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**—PC MAGAZINE,
EDITOR'S CHOICE**

"King of the Hill... Sensational... The best price-performer... Astonishing value... A steal... The number one contender..." We couldn't have said it better ourselves. Winner of PC Magazine's Editor's Choice Award and PC World's Best Buy Award, the experts love the ZEOS Notebook. And you'll love it too. At only \$1995 for our '386SX-16MHz version and \$2295 for our new 386SX-20, you simply can't find a better notebook anywhere!

As PC Magazine said, the ZEOS Notebook "offers a top notch combination of power, weight, features and price..." And you can pick your power! Choose our '386SX-16MHz version or go for the incredible new ZEOS '386SX-20MHz. Combine either with our high speed hard disk, built in 1.44MB floppy drive, VGA and more—you've got the greatest notebook going at any price!

INCREDIBLE DESKTOP FEATURES IN A NOTEBOOK.

In fact, it's really like owning a full featured desktop that you can take with you anywhere! Look closely at the details. Like our crisp 10" VGA display. The ultimate in sparkling clarity, it features advanced fluorescent backlighting for vivid VGA graphics. Then, the drives.

Two drives are better than one!

First, your notebook will include our whisper quiet high speed, high capacity hard disk. It will read and write your data so fast chances are you'll hardly know it's there. Then we're building in an industry standard 1.44 Megabyte 3.5 inch floppy as well.

While most notebooks don't include a floppy drive at all, you're really going to appreciate your ZEOS notebook's industry standard 3.5" floppy. It makes loading software and transferring files a breeze. Simply toss in your 1.44 and it's done. Anyway, can you imagine a desktop system without a floppy? We couldn't either. That's why your ZEOS notebook has one. It's great!

But the features of your incredible new ZEOS Notebook don't just stop there. Detail after detail we're giving you more than anyone else. Much more, for much less. Take a closer look.

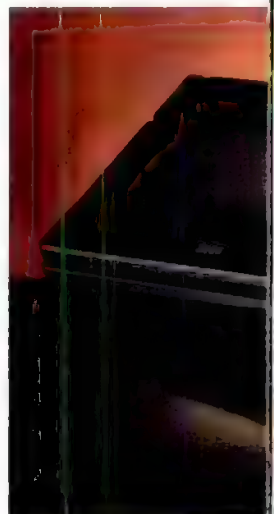
DETAILS MAKE THE DIFFERENCE!

For instance, the battery system of your new notebook is the most advanced on the market. You can quick charge, or trickle charge, any time your system is plugged in. You can also take the battery out and use the optional charging stand if you wish.

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**Now, you can
computing power
The incredible Z**



10 Good Reasons To Buy From ZEOS®

Reason #1

"Overall Excellence."

As *PC Magazine* said "Price is always a consideration. So are benchmark test results. But both factors can be deceiving, which is why we consider them in the context of other aspects that will make the difference months and years down the road."

These are the attributes which *PC Magazine* used in awarding ZEOS the coveted Editor's Choice, not once but *eight* times. And "Overall Excellence" are the very words *PC Magazine* used in describing ZEOS systems comparing them to all others.

Reason #2

Dazzling Performance.

In one recent '386 review, *PC Magazine* awarded ZEOS Editor's Choice. "The ZEOS '386 blows away every other computer... a smart choice" is what they said. And in another recent review, *Government Computer News* said the ZEOS 33MHz '386 is "arguably the fastest MS-DOS and OS/2 micro in the world."

Dazzling Performance is built into every ZEOS system. It's a key component of ZEOS Overall Excellence.

Reason #3

Exceptional Quality.

PC Resource Magazine put it this way, "ZEOS... provides quality comparable with IBM or Compaq and does so for about 70% of the price." ZEOS uses only the very best components. And every system is fully tested and burned-in right in our own labs.

Reason #4

Value.

InfoWorld says, "We find the ZEOS '386 an excellent value. Speed:



Excellent. Compatibility: Excellent. Value: Excellent." *Personal Computing* said, "ZEOS... is the best value we've come across... its performance is right up there with the slickest, most expensive PCs you can buy."

Reason #5

Warranties and Guarantees.

ZEOS believes in its products. That's why we offer each and every customer our 30 Day Absolute Satisfaction Money Back Guarantee, no questions asked. Plus, our One Full Year Limited Warranty and Express Parts Replacement Policy. Optional On Site Service is available too. Call for details.

Reason #6

24 Hour Toll Free Technical and Sales Support.

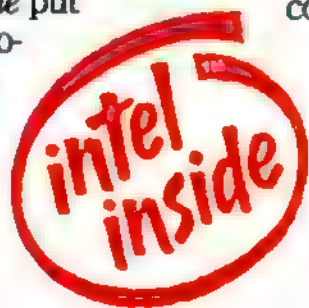
At ZEOS, the customer is #1. That's why we invented 24 Hour a Day Tech Support. For *your* convenience. If you buy a product from us we feel we should be there to help, any time of the day or night. Give us a call Toll Free! 800-423-5891. Anytime!

Reason #7

Experience.

Almost unique in the mail order computer industry, ZEOS maintains its own chip level Research and Development staff. In addition to Systems Manufacturing, we also operate our own Board Level Manufacturing facility.

ZEOS has been involved in Research and Development since our incorporation back in 1981. Our strong and experienced Research, Manufacturing and Technical Staff translates into superior factory direct computer systems for you.



Reason #8

A Sterling Reputation.

In magazine after magazine and review after review ZEOS systems are cited for Overall Excellence, for Excellent Value, as the Right Choice and so on. All of this is flattering but the most important thing is this: What do our customers think? Frankly, they love us. The systems and the support. That means more to us than anything.

Reason #9

Easy to Buy.

ZEOS systems are easy to buy. You can pick up the phone any time of the day or night and order your new ZEOS computer. And we accept MasterCard, Visa, Discover, American Express, and Corporate Purchase Orders from Fortune 1000 Companies, Colleges, Universities and Governments. Complete Leasing Programs are available as well.

And now the Z-CARD! It's your very own ZEOS Credit Card and you can apply today. With the Z-CARD you can charge your ZEOS purchases and pay in easy monthly installments. It's just like a Bank Card. Why not apply for your Z-CARD now!

Reason #10

You're Going to be Very Satisfied.

When it comes right down to it, you're going to be very satisfied with your new ZEOS system. Our goal is your complete satisfaction. And that's our commitment to you. To quality. To performance. To reliability and support. To *Value*. We don't just say it, *we Guarantee it!*

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St. Paul, MN 55112. We'll give you a call as soon as your credit line is established!*

Please complete all appropriate sections, *providing at least two years residence and employment history*. **THIS IS NOT A CREDIT AGREEMENT!** One will be sent to you upon authorization of an account. (This Form Must Be Signed To Process Your Order.) All Financed Purchases Are Subject To Credit Approval. **If You Have Any Credit Questions, Please Call 800-421-8942 For Assistance. Thank You!**

A married person may apply for individual credit. I am applying for (please check appropriate box):

- ☐ **JOINT CREDIT** with another person. Complete entire application.
- ☐ **INDIVIDUAL CREDIT** but rely on income or assets of another person as a basis for repaying the credit requested. Complete entire application.
- ☐ **INDIVIDUAL CREDIT**. Do not complete Section C.**

**If you are a married Wisconsin applicant, you must provide your spouse's information as indicated, even though your spouse may not be signing the contract.

NOTICE TO WISCONSIN APPLICANTS: YOU MUST DISCLOSE YOUR MARITAL STATUS:

☐ married ☐ unmarried ☐ legally separated

A. YOUR PERSONAL INFORMATION

Name _____

Home Phone (_____) _____

Soc. Sec. No. _____ Date of Birth ____/____/____

Address _____ Apt. _____

City _____ State _____ Zip _____

Since? (Mo./Yr.) _____ ☐ Buy ☐ Rent ☐ Other _____

Previous Address _____

City _____ State _____ Zip _____

Employer _____ Since? (Mo./Yr.) _____

Monthly Gross Salary \$ _____ Daytime Bus. Phone (_____) _____

Previous Employer _____ From - To _____

Occupation _____

Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as basis for repaying this obligation.

Additional Monthly Income \$ _____ Source: _____

Name & Address of Nearest Relative Not Living With You _____ Relationship _____

B. CREDIT INFORMATION

PLEASE TELL US IF YOU HAVE: Checking Account ☐ Yes ☐ No
Savings Account ☐ Yes ☐ No

	Y/N	How Many?		Y/N	How Many?
Bank Loan	_____	_____	Dept. Store Charge Card	_____	_____
VISA	_____	_____	Credit Union Account	_____	_____
MasterCard	_____	_____	Other Major Charge Cards	_____	_____
Finance Company Loan	_____	_____			

C. JOINT APPLICANT INFORMATION

Joint Applicant's Name _____

Soc. Sec. No. _____ Date of Birth ____/____/____

Address _____ Apt. _____

City _____ State _____ Zip _____

Home Phone (_____) _____ Date of Residence (Mo./Yr.) _____

Joint Applicant's Employer _____ Since? (Mo./Yr.) _____

Bus. Phone (_____) _____ Monthly Gross Salary \$ _____

CUSTOMER AUTHORIZATION

I authorize ZEOS International, Ltd. or its assignees to investigate credit records and to report my performance hereunder to credit agencies. I hereby certify that the following information is furnished to you for the purpose of obtaining credit and is true and correct to the best of my knowledge and belief.

Applicant's Signature _____

Date _____

Joint Applicant's Signature _____

Date _____

FOR MARRIED WISCONSIN APPLICANTS:
I acknowledge that the obligation described herein is being incurred in the interest of my marriage or family.

Buyer's Signature _____ Date _____

There are costs associated with the use of this credit card. To obtain more information about these costs, call us at 800-421-8942 or 612-635-0613 or write to ZEOS, Z•Card Processing Center, 530 5th Avenue N.W., St. Paul, MN 55112.

NY—A consumer credit report may be requested in connection with this application or in connection with updates, renewals or extensions of any credit granted as a result of this application. If I subsequently ask for this information, I will be informed whether or not such a report was requested and, if so, the name and address of the agency that furnished the report.

OH—THE OHIO LAWS AGAINST DISCRIMINATION REQUIRE THAT ALL CREDITORS MAKE CREDIT EQUALLY AVAILABLE TO ALL CREDITWORTHY CUSTOMERS AND THAT CREDIT REPORTING AGENCIES MAINTAIN SEPARATE CREDIT HISTORIES ON EACH INDIVIDUAL UPON REQUEST. THE OHIO CIVIL RIGHTS COMMISSION ADMINISTERS COMPLIANCE WITH THIS LAW

*Financing not available in Alaska, Hawaii or outside the continental U.S.

UTILITIES DATA COMPRESSION

DATA COMPRESSION UTILITIES: SUMMARY OF FEATURES

Products listed in ascending price order

	LHA	PAK	Hyper	ARJ	PKZIP	ARC Plus
List price	Free	\$15.00 (shareware)	\$20.00 (shareware)	\$30.00 (shareware)	\$47.00 (shareware)	\$89.95
COMPRESSION						
Allows move (compress and delete)	■	■	■	■	■	■
Offers password protection	□	■	□	■	■	■
Stores path names	■	■	■	■	■	■
Stores CRC information	■	■	□	■	■	■
Maximum comment field size	N/A	55K	N/A	2K	60K	49K
Other compression formats supported	None	.ARC, .ZIP	None	None	None	None
DECOMPRESSION						
Provides warning before overwriting	■	■	■	■	■	■
Overwrites only if compressed version is more recent	■	■	□	■	■	■
Extracts to standard DOS output	■	■	□	■	■	■
User can specify output from stored path	■	■	■	■	■	■
INTERFACE						
Includes compression front end	□	Optional (\$30)	□	□	□	■
Includes decompression front end	□	Optional (\$30)	□	□	Optional (\$36)	■
SELF-EXTRACTING MODULES (SFXs)						
SFX overhead	1.6K	6.7K	15.7K	13.7K	12.5K	9.9K
SFX has display screen	■	□	□	□	■	□
User can abort SFX	■	□	□	□	■	□
Batch file can be run in SFX	■	□	□	□	■	□

■ — Editors' Choice

■ — Yes

□ — No

N/A — Not applicable: The product does not have this feature.

longer, on the average, than downloading .ZIP files with MNP 5 compression turned on, and 31 percent longer than downloading .ZIP files with MNP 5 turned off.

Rumor says that it's important to turn off MNP when downloading compressed files because the attempt to compress further only introduces extra overhead. Our test verified that downloading .ZIP files with MNP 5 compression takes longer than transmitting without it, but only by a margin of 8 percent.

COMPRESSION FOR EVERYONE

Casual users of compression utilities are sometimes put off by the programs' arcane command-line interfaces. Now, several programs come with or offer as an option front-end shells that make using them easier. There are also a number of add-on shells available (see the sidebar "Putting a Friendly Face on Data Compression").

Once you get past the interface, or the lack thereof, these programs prove to be very useful. First, if you explore file libraries on BBSs or PC MagNet, you'll encounter .ZIP and .ARC files. Second, you can use these utilities to keep old files

around longer before you archive them onto floppy disks. Third, you can squeeze more onto those floppy disks by compressing files first. Fourth, when you need to send files to someone else, whether by modem or floppy disk, you can keep related files together and reduce the transmission time or number of floppy disks.

Like clothing crammed into a closet, data always seems to fill all the available space on a hard disk, but unlike clothing in a closet, data shrinks to fit. The results are worth the effort.



SEA International's \$89.95 *ARC Plus* provides average compression and poor speed but displays one of the slicker user interfaces of the products evaluated here.

On most of our tests, it came in third or fourth, but its ability to compress files is still very impressive compared with that of programs on the scene just a few years ago. On a test with three text files totalling 250K, *ARC*, Version 5.21, compressed to 95K (62 percent), while *ARC Plus* re-

duced the file to 72K (82 percent), which is only about 2K more than *LHA*, the best compressor. This is typical of all the products; the differences between them on compression size are not that great.

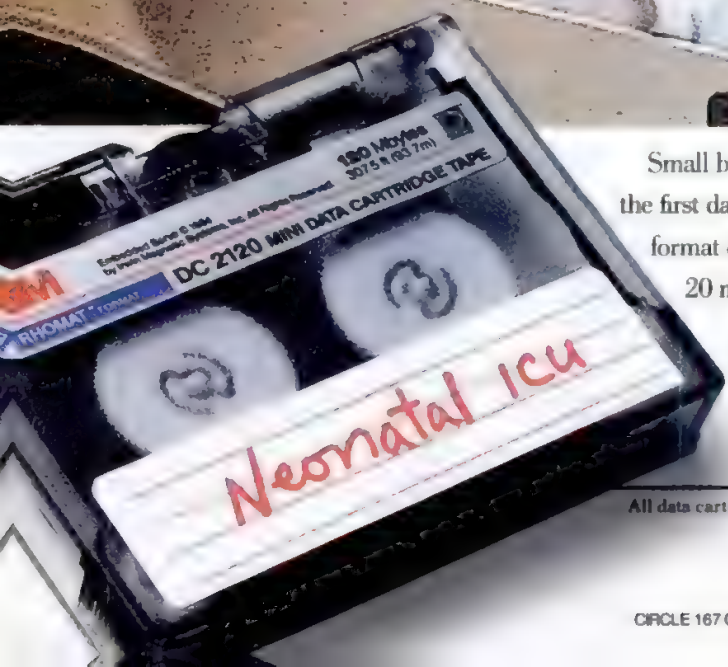
This is not so for the difference in speed. *ARC*'s traditional weakness has been speed, and that weakness remains. Out of 15 files on our tests, *ARC Plus* was last for time of compression on 9 and last for time of decompression on 11. Often it was last by a large amount. Some compression tests took almost twice as long as the second-slowest compressor, and one decompression time was 15 times that of the fastest decompressor. While these differences aren't in minutes, the difference between 60 seconds and 8 seconds to decompress a 1MB .EXE file is noticeable.

There is a tradeoff in the compression game between speed and compression size, and *ARC Plus* has an optional quick mode. On our informal test, quick-mode compressed the 250K of text files to 95K in 4 seconds, and normal mode compressed them to 72K in 12 seconds.

The older *ARC* version established the user interface that all of these programs



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UTILITIES DATA COMPRESSION

use. You type in commands and filenames as parameters, and the program runs without giving any feedback. *ARC Plus* improves on that in two ways. You can still use the command line parameters that power users love, but progress is now tracked in a helpful pop-up box.

More-casual users will probably use a shell called *EZARC* that comes with the program. *EZARC* shows a split screen with DOS directories on one side and the contents of *ARC* on the other. You can tag and selectively arc or unarc. *EZARC* is not as functional as *ArcMaster* or *Shez* (see the sidebar "Putting a Friendly Face on Data Compression"), but it is a big improvement over the command line. *ARC Plus* also includes a utility called *MARC*

that will merge multiple .ARC files.

ARC Plus ships in both OS/2 and DOS versions, and the SFX files it creates can be set up as DOS, OS/2, or OS/2-family executables. If speed is important to you, you'll certainly want to look elsewhere, and if you want a fancy interface, you'll do better with *PAK* or one of the third-party shells.

ARC Plus, Version 7.12

SEA International Inc., 925 Clifton Ave., Clifton, NJ 07013; 201-473-5153.

List Price: \$89.95.

Requires: 512K RAM, DOS 2.0 or later or OS/2 1.0 or later.

CIRCLE 396 ON READER SERVICE CARD



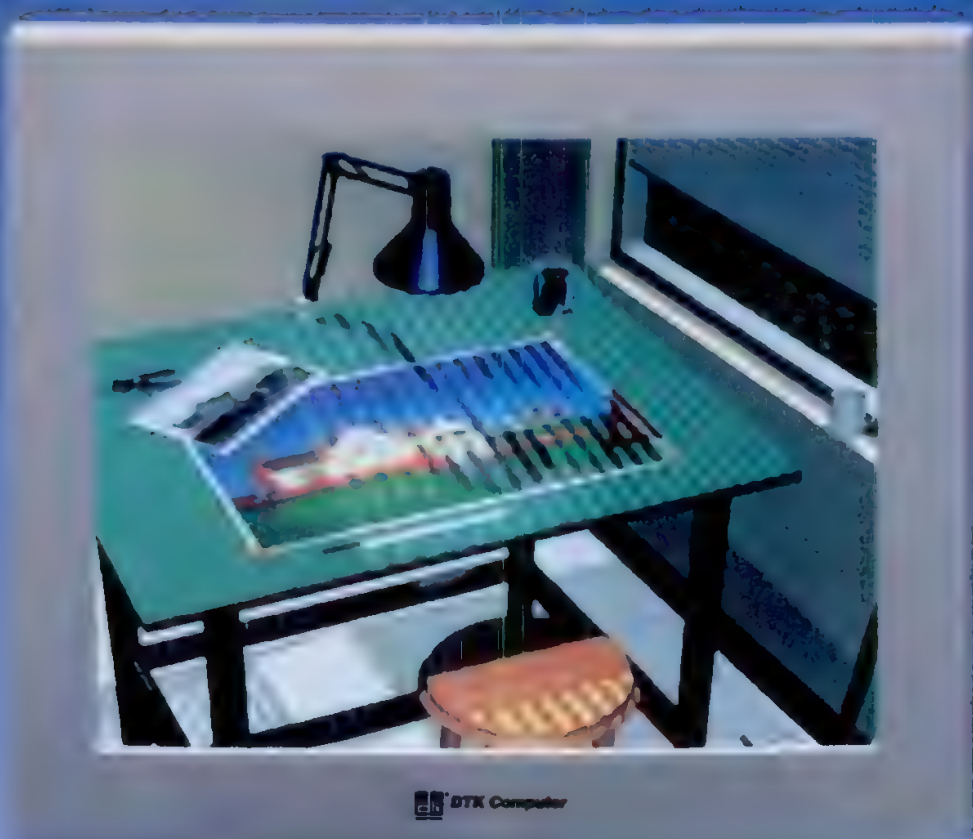
Robert K. Jung's \$30 *ARJ*, Version 2.0, combines excellent compression sizes and speed with acceptable decompression times. The J stands for the author's last name but it could also stand for Japanese, since much of the original motivation came from the Japanese compression group, especially Haruyasu Yoshizaki, the author of *LHA*. Jung has combined that foundation with academic research to produce an impressive product.

On the Compressed File Size tests, it was close to a dead heat between *ARJ* and *LHA*. *ARJ* did better than *LHA* on the important .EXE, text, and .DBF samples,

DATA COMPRESSION ALTERNATIVES

General-purpose data compression utilities, such as the ones evaluated here, comprise only one category of tools for squeezing more data onto less disk space. This chart lists several compression strategies, notes some of the products that accomplish them, and outlines the advantages and disadvantages of each method.

COMPRESSION METHOD	PROS	CONS
General-purpose compression - ARJ (\$30) - LHA (free) - PKZIP (\$47)	- Very inexpensive (many are free) - Fast - Effective compression of most data types	- Cryptic command-line interfaces - Some packages compress only to proprietary formats
Program-specific compression SQZ (\$99)	Designed to integrate well with a single application	Useless for other compression tasks
MNP 5 or V.42bis modem compression (\$200 and up)	- From 2:1 to 4:1 compression - Good for data transmission - Automatic	- Both sides need modem - Relatively expensive solution - Less effective than general-purpose utilities
On-the-fly compression: hardware/software combinations - ExpanZ (\$199) - Stacker (\$229)	- Automatic - Great way to save disk space - Faster than software-only on-the-fly compression	- Relatively expensive solution - Requires expansion slot - Cannot transmit compressed data
On-the-fly compression: software - Stacker (\$149) - SuperStor (\$129)	- Automatic - Great way to save disk space - Does not require an expansion slot	- Slower than foreground utilities - Cannot transmit compressed data
.EXE compressors - AXE (\$50) - PKLite (\$47)	- Runs compressed .EXE and .COM files - Automatic	Useless for other compression tasks
Backup software - Central Point Backup (\$99) - Fastback Plus (\$189) - The Norton Backup (\$149)	Backs up and compresses data in one step	Compression formats are proprietary



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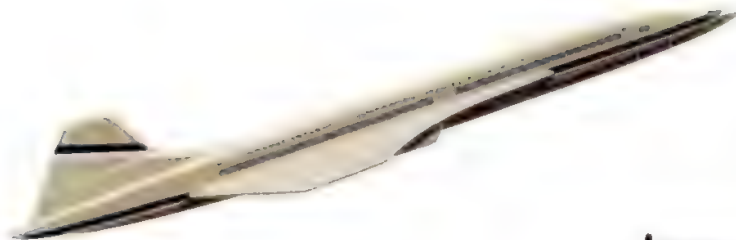
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Co-Processor	80C 287 socket	80487SX socket	80487SX socket	Upgradable to 486 20MHz	Integrated
Memory (Std., Max.)	1MB/2MB	2MB/4MB	2MB/8MB (64K cache)	4MB/16MB	4MB/16MB
Hard Disk Drive	40MB	60MB	60MB	120MB	120MB
LCD Size	Backlit 8.85"	Backlit 8.85"	Backlit 8.85"	Edgelit 10.1"	Edgelit 10.1"
Video/Gray Scales	VGA/16	VGA/16	VGA/42	VGA/64	VGA/64
Power Management	• Suspend/Resume • Sleep mode • Low battery operation	• Suspend/Resume • Sleep mode • Low battery operation	Premier System Management™ • Standby/Resume • Rest/Resume • Power Save • 1 unattended communications	Intelligent Power Management™	Intelligent Power Management
Software	MS-DOS® included	MS-DOS included	MS-DOS pre-installed, Microsoft Windows® v. 3.0 included	MS-DOS and Microsoft Windows v. 3.0 pre-installed	MS-DOS and Microsoft Windows v. 3.0 pre-installed
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PERFORMANCE TESTS: DATA COMPRESSION UTILITIES

Data compression utilities force you to evaluate the trade-off between speed and compression. No one package offers both.

HOW WE TESTED

To test data compression utilities, we used representative samples from 15 file types. The first 5 types are standard formats for application command files, databases, spreadsheets, and word processors. The last 10 types are graphics file formats.

For the graphics files, we scanned a single color picture and converted it to gray-scale and black-and-white images for each format. Two of the graphics formats, Compressed TIFF and .GIF, use their own form of data compression. We included them in the tests to see how the products handle files that are partially or fully compressed.

We ran these tests on a 25-MHz Compaq Deskpro 386/25e with 8MB of extended RAM and a 300MB hard disk. The hard disk was formatted under Compaq DOS 4.01 and divided into two 150MB partitions. Sample files were stored on the C: drive. The D: drive, used for archiving and restoring, was re-formatted for each product.

Here is a key to the file types and the size of each sample:

TYPE	SIZE (bytes)	DESCRIPTION
.EXE	125,440	A binary, executable command file.
.COM	19,358	A binary, executable command file simpler in structure than an .EXE file.
.WK1	467,683	A binary spreadsheet file.
.TXT	51,277	An ASCII free-form text file, typical of word processing documents.
.DBF	434,688	An ASCII fixed-length database file.
.PCX	463,478	A bitmapped graphics picture file, also called the PC Paintbrush picture format.
.PCX	25,010	As above.
TIFF	753,001	A bitmapped graphics file that uses the Tagged Image File Format (TIFF).
TIFF	100,634	As above.
Compressed TIFF	291,385	A compressed TIFF file.
Compressed TIFF	28,616	As above.
.BMP	754,602	A Windows bitmapped graphics file.
.BMP	96,788	As above.
.GIF	358,718	A compressed bitmapped graphics file that uses the Graphics Interchange Format (.GIF). The .GIF format is supported by CompuServe.
.GIF	26,082	As above.

—Gray-Scale image (8-bit) —Black-and-white image (2-bit)

CONTINUES

but only by an insignificant 0.4 percent, 0.5 percent, and 0.7 percent respectively. LHA did better on the graphics files but never by more than 0.8 percent.

Compression times were respectable. Except for already compressed files (.GIFs and compressed TIFFs), ARJ was always within 1.7 times the speed of the fastest compressor and an average of only 1.45 times. Decompression times were a little worse but still acceptable, averaging 1.85 times the fastest speed on uncompressed files.

ARJ comes with many extra options, including the capability to add only files

with a date after a given one to an archive. The other compression programs allow comments one line in length; ARJ comments can be up to 2K.

The ARJ package includes a program that enables users to re-sort ARJ directories and to change other kinds of compression archives to ARJ's. For an additional fee, you can put a security envelope around your ARJ archives. This assigns a special ID to each ARJ file you make, which insures that it can't be tampered with without losing its original ID. Recipients can be told which ID to look for, to be sure the file is secure.

The author provides support via mail, Internet electronic mail, and several BBSs. If your main criterion is compressed size, ARJ will be one of your two main contenders, along with LHA.

ARJ, Version 2.0

Robert K. Jung, 2606 Village Rd. West, Norwood, MA 02062; available on PC MagNet's Utilforum, section 16, as ARJ.EXE.

List Price: \$30; with security envelope, \$50 (shareware).

Requires: 340K RAM, DOS 2.11 or later.

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UTILITIES

DATA COMPRESSION

PERFORMANCE TESTS: DATA COMPRESSION UTILITIES

- The **Compression Time** test measures the amount of time a product takes to compress and archive the sample file using default settings. Each sample is archived to a separate file.
- The **Decompression Time** test measures the amount of time a product takes to unarchive the sample file and restore it to its original size.
- **Compressed File Size** indicates the size of the file after compression, expressed as a percentage of the original file size.

WHAT THE NUMBERS MEAN

The test results show a trade-off between speed and amount of compression. On the average, **PKZIP** was the fastest product but achieved the least amount of data compression. **LHA** and **ARJ**, the best compressors, usually lagged behind the leaders in speed. **ARC Plus** turned in mediocre performance on both counts, managing only average compression and usually finishing last in speed.

Although the differences were slight, some products showed they were better at compressing particular types of files.

ARJ was best at compressing ASCII and executable files, while **LHA** squeezed the most out of the graphics formats. **Hyper** was particularly adept at spreadsheets.

Note that none of the products could compress the gray-scale .GIF file, and they actually increased the size of the black-and-white .GIF. Because black-and-white .GIF files have no redundant information to eliminate, a compression algorithm only adds its coding scheme to the file when attempting to compress it further. The percentage points above 100 show the amount of coding overhead generated by each of the products.

COMPRESSION TIME Elapsed Time (seconds)

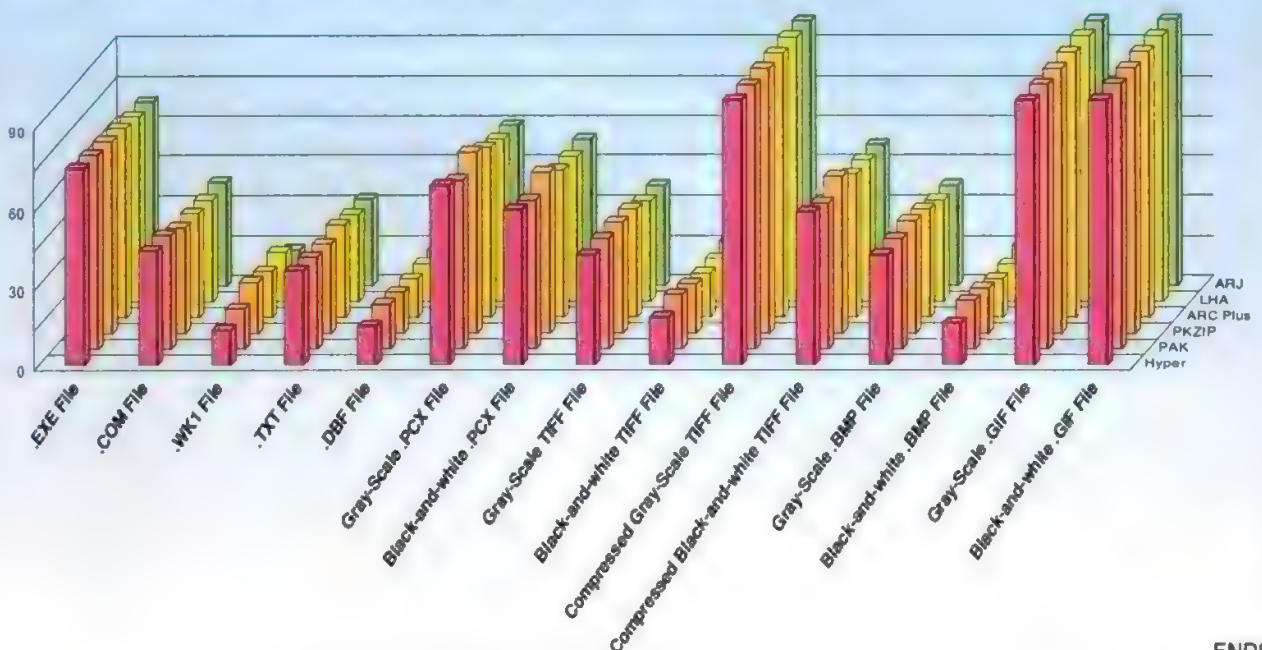
	EXE FILE	COM FILE	WK1 FILE	TXT FILE	DBF FILE	.PCX FILE		.TIFF FILE		.TIFF FILE		.BMP FILE		.GIF FILE	
															
ARC Plus	104.46	1.56	24.18	4.01	16.30	37.54	2.06	42.39	3.42	28.68	2.80	42.56	3.12	37.59	3.34
Hyper	66.71	1.43	11.86	2.37	11.69	23.43	1.75	29.41	3.76	6.48	1.93	29.46	3.26	8.47	2.47
PAK	60.81	1.71	18.06	2.61	13.44	20.70	1.75	32.84	4.61	17.05	1.91	32.99	4.44	20.51	2.10
LHA	58.95	1.82	21.73	2.92	19.75	24.95	1.84	39.94	5.16	13.18	2.05	40.10	4.94	16.04	1.66
ARJ	58.44	1.16	15.50	2.43	12.83	22.16	1.70	44.37	5.18	16.10	1.95	44.45	5.10	19.38	2.59
PKZIP	37.52	0.68	13.98	1.94	21.58	14.18	1.33	30.51	5.98	8.00	1.78	28.43	5.48	8.40	1.07

DECOMPRESSION TIME Elapsed Time (seconds)

	EXE FILE	COM FILE	WK1 FILE	TXT FILE	DBF FILE	.PCX FILE		.TIFF FILE		.TIFF FILE		.BMP FILE		.GIF FILE	
															
ARC Plus	66.73	1.30	8.00	1.93	6.08	18.96	1.61	20.25	2.20	23.59	1.62	20.25	1.80	2.38	0.79
Hyper	54.90	1.25	6.18	1.80	5.89	18.08	1.53	19.30	2.20	1.47	1.61	19.41	1.85	1.67	0.89
ARJ	20.30	1.00	4.01	1.33	3.80	7.75	1.13	9.07	1.55	6.50	1.22	8.98	1.49	7.80	1.21
LHA	19.68	0.78	3.34	1.08	2.98	7.61	0.78	8.33	1.05	5.98	0.84	8.30	0.92	7.41	0.73
PAK	19.21	1.00	3.87	1.01	3.73	6.33	0.99	8.00	1.67	6.23	1.00	8.03	1.33	7.35	0.88
PKZIP	8.33	0.77	2.31	0.91	2.11	3.42	0.71	4.19	0.90	1.66	0.74	4.07	0.88	1.81	0.85

■ —Gray-Scale image (8-bit) ■ —Black-and-white image (2-bit)

COMPRESSED FILE SIZE (Expressed as a percentage of decompressed file size)



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—PC Magazine 5/28/91

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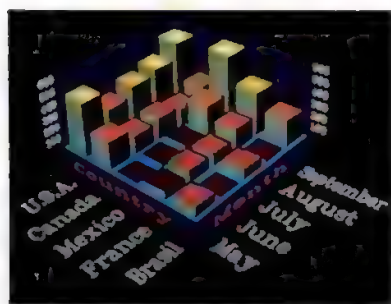
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DATA COMPRESSION

Hyper is a \$20 shareware file-compression program from Peter Sawatzki and Klaus Peter Nischke. This German program, along with the Japanese *DIET* and *LHA* and the French *LZEXE*, shows how international the compression game is.

Hyper is a bare-bones program, but its compression sizes are in the range of the other programs; it is a good choice if you have lots of spreadsheets to compress. It ranked first on our .WK1 tests for both compression size and compression time.

The program's decompression times, however, are relatively slow. It came in next to last, with only *ARC Plus* proving slower overall.

Hyper's feature set contains the bare minimum. It has an SFX module and allows storage of path names but is lacking password-protected archives and comments. You cannot decompress a file to standard DOS output. This feature, present in the other five programs, is useful because it lets you pipe the output to a file-listing program like Vern Bueg's *LIST* and view text files in the archive. Source

code in Turbo Pascal is provided to enable users to read the directory of a *Hyper* archive.

If your main need is to compress *Lotus 1-2-3* worksheets, you should give *Hyper* serious consideration. Otherwise, one of the other programs would probably be a better choice.

Hyper, Version 2.5
Peter Sawatzki, Buchenhof 3, 5800
Hagen 1, Germany; available on PC

**MagNet's Utilforum, section 16, as
HYPER.ZIP.**

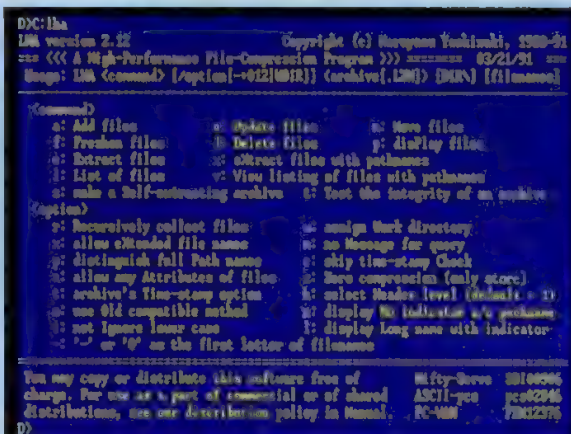
List Price: \$20 (shareware). No requirements.

CIRCLE 398 ON READER SERVICE CARD

LHA

Haruyasu Yoshizaki's *LHA* is a masterful file-compression program that's available for free. Its author gained fame with his

All of the programs evaluated here have command-line syntaxes with a bewildering array of options. This is *LHA's* syntax explanation screen:



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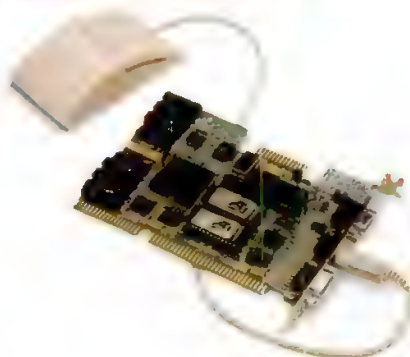
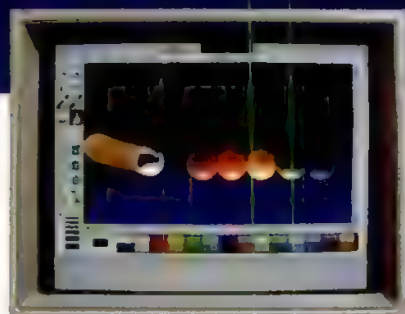
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UTILITIES

DATA COMPRESSION

original *LHARC* program in 1989, and the most recent version, 2.12 (renamed to avoid claims on the word *ARC* by SEA), provides excellent compression size and acceptable speed. Its SFX module has some extra features that make it useful for those distributing software.

LHA shares the top honors with *ARJ* on our tests of file compression size. On our speed tests it falls in the second half of the pack, but its average time was only 1.65 times the best time. Though its decompression times aren't up to *PKZIP*'s blazing speed, it came in second, just ahead of *PAK*.

Among *LHA*'s strongest features is the level of customization allowed with the self-extracting .EXEs. If you have a text file named "!" as the first file in the *LHA* archive, when a user runs the .EXE, that file will be displayed and the user will be given the option of aborting the decompression. In addition, if there is a batch file named !.BAT, running the .EXE with the parameter -! will run the batch file.

Also noteworthy about *LHA*'s SFX is the small overhead. The extra size of an SFX module over a plain *LHARC* is a mere 1.9K. If you restrict the type of compression used, *PKZIP*'s 2.6K is close, but otherwise, the overhead in competing programs is three times as great or more.

The distribution policy for *LHA* is extraordinarily generous. As long as you include the original copyright, the most severe restriction is that it cannot be distributed with copy-protected products. While support from the author is not directly available in the United States, there is help available on GEnie and CompuServe. This free program should be in everyone's toolbox.

EDITORS' CHOICE

LHA, Version 2.12

Available on several BBSs and PC MagNet's Utilforum, section 16 as *LHA.EXE*. **List Price:** Free (shareware). **Requires:** 384K RAM, DOS 2.1 or later.

CIRCLE 399 ON READER SERVICE CARD



NoGate Consulting's *PAK*, Version 2.51, stands out, because of its support for multiple compression formats and multiple user interfaces. You can purchase three different licenses for this product: a shareware command-line version for \$15, a full-screen shell interface for \$30, and a

PAK's optional \$30 shell interface includes hypertext-based help information that casual users will find useful.



\$75 programmers' toolkit with object code to deal with the native .PAK format from programs that were written in C, Pascal, or Assembler.

PAK's performance does not stand out. It was next to last on tests of file compression size (though still within 10 percent of the most effective compressions), average in compression speed, and tied for second in decompression, way behind *PKZIP*'s speedy times.

PAK has a wide array of extra features that includes comment writing, password protection, and a security envelope, but its most striking feature is support for .ZIP and .ARC files as well as its native .PAK files. You can also read or write to the current version of *PKZIP* as well as the past two versions (0.9 and 1.01). *PAK* doesn't support .ARC files made by the current version of *ARC Plus*, but it will read .ARC files made with the shareware version of *ARC* and *PKARC* (which is no longer available).

Our time and compression tests for *PAK* were done in the program's native mode. On some informal tests, times were slightly longer if .ZIP mode was used.

PAK's optional command shell makes use of pop-up windows, which give it a slick feel, but it lacks a tree and many of the niceties of the standalone shells like *ArcMaster* or *Shez*. Still, it is the most pleasing interface among any of the six programs evaluated here.

If you want to deal with multiple formats within a single compression program and a menuing interface appeals to you, *PAK* is the one to get.

PAK, Version 2.51

NoGate Consulting, P.O. Box 88115, Grand Rapids, MI 49518; 616-455-6270. Available on PC MagNet's Utilforum,

section 16, as *PAK.EXE*.

List Price: Command-line version, \$15; menu-driven shell, \$30; programmer's toolkit, \$75 (shareware).

Requires: 384K RAM, DOS 2.0 or later.

CIRCLE 400 ON READER SERVICE CARD



PKZIP, Version 1.1, PKWare's \$47 shareware product, makes a clear tradeoff between speed and compression size. It combines blazing decompression times and excellent compression speed with the worst results on compression size tests.

As noted, the spread on compression sizes is not that large among the six reviewed products. While *PKZIP* came in last on 9 out of 15 tests, its average compression size is only 3 percent above the best on each test. In return for the increased size, you get decompression times with a 2.4 percent average reduction of the second-fastest times (best for each test of files not previously compressed) and the fastest compression times on 9 out of 15 tests. For many, these speed factors will outweigh the poorer performance on size.

Extra features include password protection that can be selectively applied to files in an archive, comments for both individual files and the entire archive, and a program that can fix some mildly damaged .ZIP files. The most common compression method chosen by *PKZIP* is called imploding. If all the files in an archive are imploded (and you can force that option), the SFX envelope adds only 2.8K to the archive—better than any other program except for *LHA*.

PEER ENERGYTM

News for LANtastic[®] users from Artisoft

LANtastic flexibility comes to NetWare

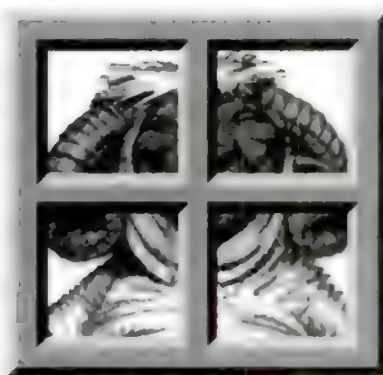
Now the user-friendly features of Artisoft's LANtastic Network Operating System are available even on a Novell network with the release of LANtastic[®] for NetWare[®].

The new Artisoft[™] software package installs on top of an existing NetWare system, and is available for \$499 for an entire network. Adding peer-to-peer flexibility to a NetWare system means that now, people connected to the network can take advantage of multiple servers and have access to data on each other's computers. The LANtastic security features will allow access to be limited to authorized users, with a variety of authorization levels available to departments and administrators.

Also available to the NetWare user for the first time is LANtastic's straightforward, intuitive user interface.

Following up on the June release of the triple-medium-connector **AE-3[™] Ethernet Adapter**, Artisoft is expanding its line of cost-effective network adapters. The new **AE-1/T[™]** card takes inexpensive **10Base-T** (unshielded twisted pair) cabling. It will connect via standard 10Base-T hubs, such as **Peer Hub[™]**, due for fall release.

Two of the new adapters offer connections to two cable types. The **AE-2/T[™]** card accepts twisted pair and thin Ethernet cabling; its brother, the **AE-2/C** connects to thin and thick Ethernet cables.



Just out! LANtastic for Windows[™] utilities.

Getting confused keeping track of all the new Artisoft products, specifications and prices? Are you still figuring out all the capabilities possible with Artisoft's new **Central Station[™]** connectivity computer? All your questions are answered on **SpecDisk[™]**, a data disk available on 360k disk (or 720k mini-disk on request). It contains the latest product information, reprints from trade publications on Artisoft products and

Peer Energy articles saved for posterity.

Artisoft company headquarters is moving east—about 100 yards east, across a desert arroyo, to a new company-owned 40,000 sq. ft. office complex from the present 19,000 sq. ft. building leased since spring of 1989. Already underway, the transfer of people and their computers to the new space will be complete before the end of the year.

Two new key executives have been added to the Artisoft management team. **Adrian King**, former assistant general manager of the Network Business Unit at Microsoft, is the new vice president for engineering. **Ken Davis**, director, marketing, brings his experience in similar capacities from Tecmar and Digital Communications Associates.

ARTISOFT

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DATA COMPRESSION

PKZIP also has a utility called *PKZIPFIX*, which repairs slightly damaged .ZIP files. Registered users can request a serial number that allows them to add authenticity verification to their .ZIP files. Only their copy of *PKZIP* will make a .ZIP file that displays the name they specify, and modification of the .ZIP file will prevent the authenticity message from displaying. An OS/2 version is available.

PKZIP itself is a command-line-driven program, but a separate \$36 program called *PKZMENU* includes tagging and drop-down menus. Unfortunately, *PKZMENU*

***PKZIP* presents a trade-off: fast compression times but disappointing compression percentages.**

deals only with extraction, so Lotus's *Magellan* or one of the full-featured shells (see the sidebar "Putting a Friendly Face on Data Compression") is probably a better choice. If you need to decompress only .ZIP files, a free program called *UNZIP* is available on PC MagNet.

The .ZIP format is a file compression standard used in many software packages. For example, you'll find programs that can alternate the wallpaper that is used each time you load *Microsoft Windows*, extracting that wallpaper from a .ZIP file. When exchanging files with others online, you are most likely to receive .ZIP files. Therefore, you should have a tool that handles them. But remember, there are alternatives to choose from: *PAK* and *Magellan*.

If speed is your priority in compression, you'll want to choose *PKZIP*. ■

***PKZIP*, Version 1.1; *PKZMENU*, Version 1.04**

PKWare Inc., 9025 N. Deerwood Dr., Brown Deer, WI 53223; 414-354-8699. Available on PC MagNet's Utilforum, section 16, as *PKZIP.EXE* and *ZIPMNU.ZIP*.

List Price: *PKZIP*, \$47; *PKZMENU*, \$36 (shareware).

Requires: 85K RAM for *PKZIP*, 192K for *PKZMENU*, DOS 2.0 or later.

CIRCLE 401 ON READER SERVICE CARD

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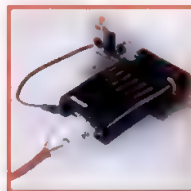
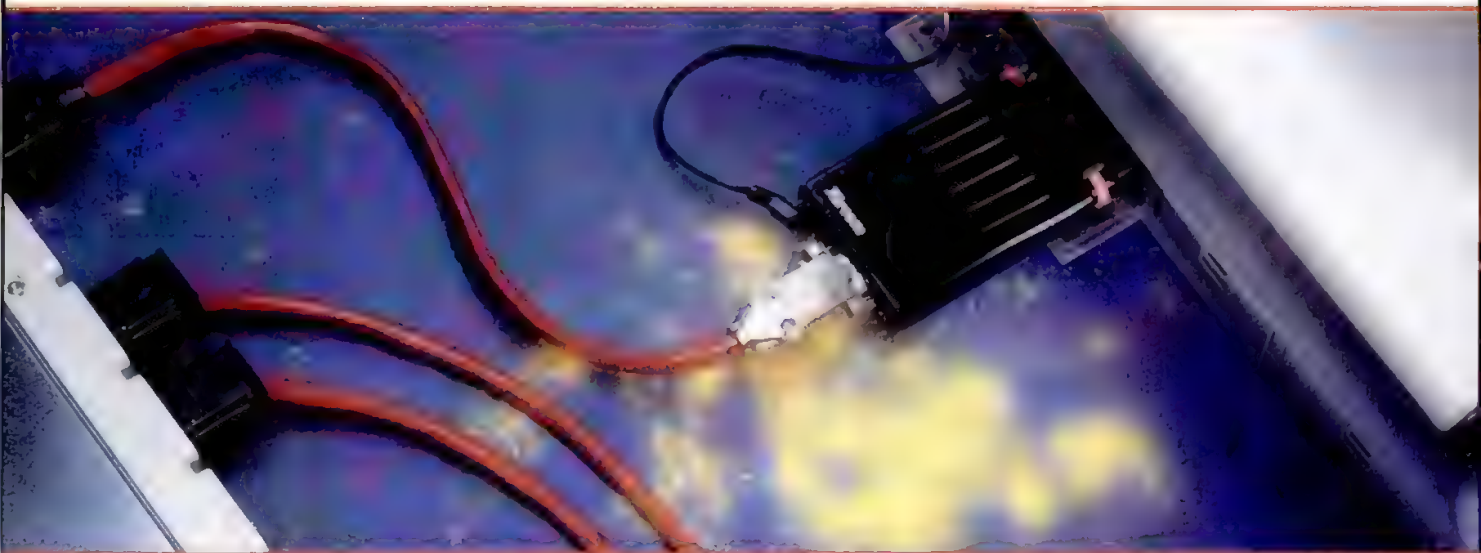
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CIRCLE 211 ON READER SERVICE CARD

NETWARE 3.11

Revising the Standard

The latest version of Novell's high-end file-server system, NetWare 3.11, remains the standard by which others are measured. New features include greater support for cross-platform connectivity, better management options, and a more flexible pricing structure.

by M. Keith Thompson



PHOTOGRAPHY: THOM O'CONNOR

Clearly, Novell's *NetWare* is the standard by which network operating systems are measured. The combined forces of Digital Equipment Corp., IBM Corp., and Microsoft Corp. have scarcely caused a ripple in the powerful flow of Big Red's boxes around the world. "Is it as good as *NetWare*?" is the first question many people have when comparing LAN operating systems.

Novell sells a variety of other products, ranging from Ethernet LAN adapters to network analyzers, but it is best known for its various versions of *NetWare*. *NetWare 2.x* has

been Novell's cash cow for the past few years. *NetWare*, Version 2.2, finally merges the older flavors of *NetWare* (*Advanced NetWare* 2.15, *ELS NetWare* Level 1 2.12 and Level 2 2.15, and *SFT NetWare* 2.15) into one manageable, full-featured product; it sells for \$895 in a 5-user version and \$5,495 in a 100-user version. *NetWare*, Version 3.11, is the new high-end product, offering greater flexibility and more bells and whistles, particularly for printing, database support, network management, and connectivity with computers that run operating systems such as Unix.

When *NetWare* 3.0 and 3.10 first reached the market, Novell gave them one price: \$7,995 for a 250-user version. The pricing structure of the latest release is somewhat more flexible. *NetWare* 3.11 costs \$3,495 for 20 users, \$6,995 for 100 users, and \$12,495 for 250 users.

The single most important difference between *NetWare* 2.x and 3.x comes from the latter's enhanced ability to run special programs in the server as part of its multi-threaded processing capability. The *NetWare* Loadable Modules (NLMs) available for Version 3.x allow you to run network management and monitoring software, install remote print servers, and add communications processes. NLMs will grow in importance, particularly in environments of mixed operating systems and computer architectures, since they can translate between different protocols and LAN architectures on the fly. *NetWare* 2.x also can run server-based applications, but its value-added processes (VAPs) have not gained a lot of support from third-party manufacturers.

NETWARE 3.11 DELIVERS

NetWare 3.0 and 3.1 were not quite ready for prime time. There were so many NLM fixes out for bugs and incompatibility problems that Novell had to write an NLM to manage the patches. *NetWare* 3.11 incorporates all of these fixes into the operating system.

When *NetWare* 3.0 was announced, Novell touted it as a multiple-protocol file-server platform for connectivity to all types of computers. The product did not have all the pieces in place to make good on the promise at the time, but *NetWare* 3.11 provides the tools to link a variety of computer systems under *NetWare*'s umbrella. By adding TCP/IP support on the server, *NetWare* 3.11 allows seamless integration with many Unix-based com-

puters. Interoperability is growing in importance and Novell is not the only company to realize that (see the sidebar "Connecting to Other Platforms: Three Solutions for Interoperability").

Novell wants to offer a universal server

for client computers working under a variety of operating systems. Not all operating systems are limited by the 8-plus-3-character naming convention of MS-DOS, so Novell has enhanced *NetWare*'s multiple-name-space functions in Version 3.11. The *NetWare* 3.11 server software allows people to use more-mean-

NETWARE CERTIFICATION: A Seal of Approval, but for How Long?

by M. Kelth Thompson

You've seen the Novell Labs "Tested and Approved" logo at trade shows and in brochures, but what guarantee does it provide? Novell Labs certification means different things for different types of products. The company's Independent Manufacturer Support Program (IMSP) establishes a relationship between Novell and a third-party vendor in order to ensure *NetWare* compatibility. Novell's certification process assures customers that the products they buy will run *NetWare* without compatibility problems, but you should be careful not to accept this as a blanket statement.

Obtaining certification is an expensive process for a vendor, but the price is reasonable for Novell given the amount of work its testers perform. For many vendors, however, certification can be short-lived. When Novell makes changes to its operating system or the vendor changes anything about its product, certification becomes null and void. Many companies manage to obtain certification once and do not spend the effort and money to recertify, but continue to tout Novell's approval. Novell tries to police this type of activity but cannot catch everyone. You can protect yourself by getting a complete list of Novell Labs-certified products directly from Novell.

GETTING NOVELL APPROVAL

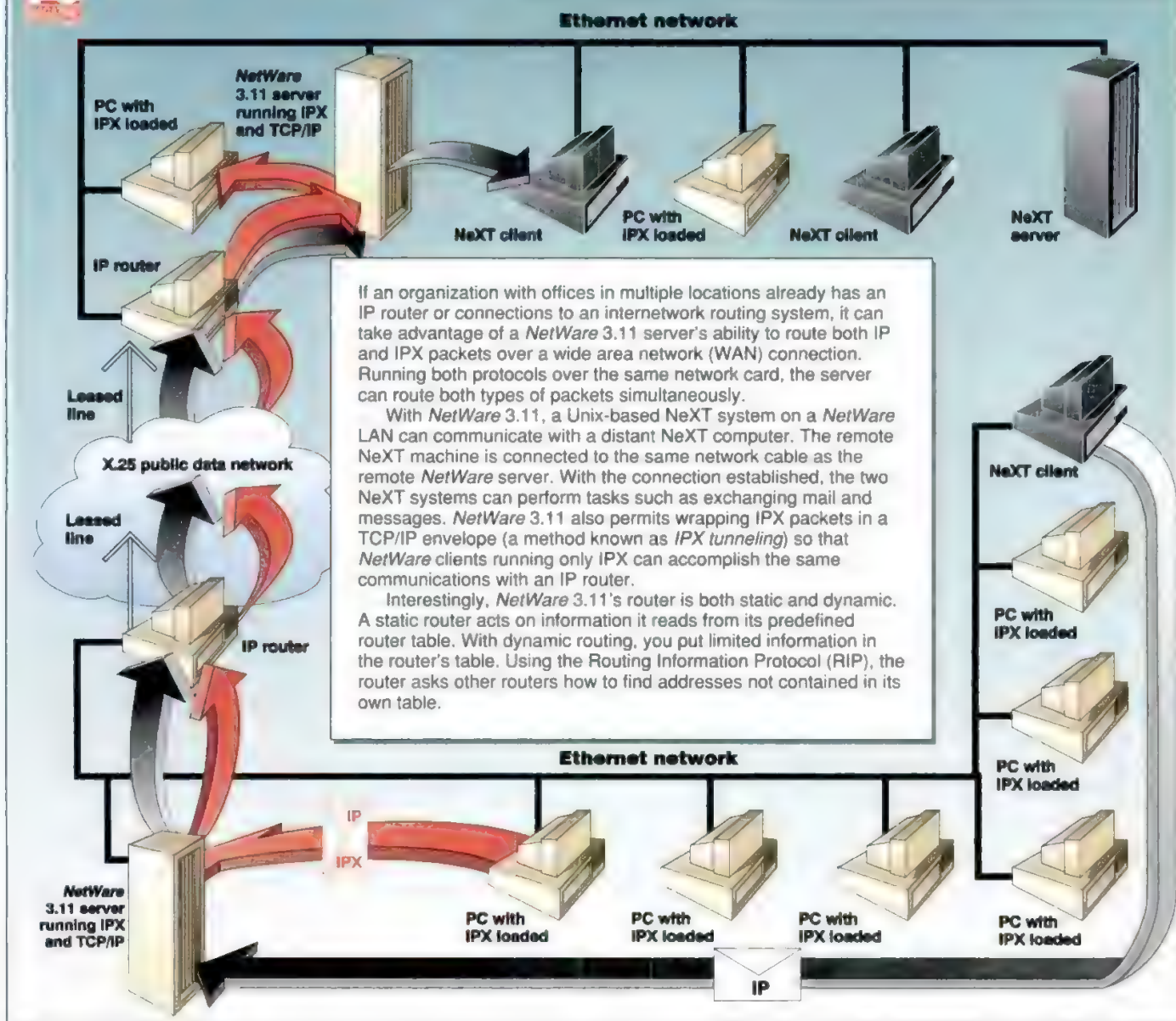
File servers are the most commonly certified products. To be approved, a file server must pass a suite of tests while configured the way the vendor, who typically sells a complete system, offers it to customers. A file server has to be certified for a particular *NetWare* release. With each release, Novell ships

drivers for a number of LAN interface cards; it therefore tests the computer with each card. If you or the vendor change any of the components, such as the hard disk or controller, the system is no longer certified. Novell Labs also ensures compatibility with other Novell products, such as *NetWare* SNA Gateway, *NetWare* SQL, and *Btrieve*. It costs \$6,000 to certify a file server for either *NetWare* 3.11 or *NetWare* 2.2, or \$8,000 for both.

Drivers for hard disks and network interface cards (NICs) pass similar tests. Novell tries them out in numerous configurations with certified servers to prove their compatibility. Hard disk and NIC vendors can prepare their products ahead of time because Novell includes the test suite employed at Novell Labs in the developer's kits that the vendors use to develop their drivers. Disk driver testing runs \$1,500 per version of *NetWare* tested. NIC driver certification costs between \$2,000 and \$4,000, but because *NetWare* 3.11 and *NetWare* 2.2 use the same NIC driver at the workstation, the price covers both versions. Novell also certifies other types of products, including printers, UPSs, backup devices, and fax servers.

Novell Labs approval, used correctly, can give network administrators and users peace of mind. When buying a system or component, ask a few simple questions: For what version of *NetWare* is the product certified? When did the product pass certification? Technology advances being what they are, if it was years ago, the product probably passed with older hardware and the new product is no longer certified. Keep that in mind before you buy. ■

NETWARE'S SIMULTANEOUS ROUTING CAPABILITIES



ingful filenames if the operating system on the client PC supports them. This release supports OS/2's High Performance File System (HPFS). HPFS provides excellent disk caching, disk partitions of up to 2 gigabytes, and extended file attributes. You can assign filenames with spaces, case sensitivity, and up to 255 characters.

With add-on NLMs, *NetWare 3.11* also supports *Network File System (NFS)*—a file-server program widely used in the Unix world—and it includes better support for the Macintosh file system. Serv-

ers running the optional NFS and Macintosh NLMs can store files from Unix and Macintosh computers in their native formats.

Installing *NetWare 3.11*, which is shipped on 20 floppy disks, takes about half an hour. The installation program creates the AUTOEXEC.NCF file; you input information such as the network adapter and disk controller being used.

From there, it's a simple matter of adding administrative information such as a list of users on the systems, their rights, and other pertinent data.

TCP/IP: CROSS-PLATFORM CONNECTIVITY

The most talked-about and useful feature in *NetWare 3.11* is TCP/IP support at the server. Transmission Control Protocol/Internet Protocol (TCP/IP) is a standard that provides connectivity across computer platforms ranging from mainframes to Macintoshes. These computers can exchange data when connected over a compatible network scheme, such as Ethernet or X.25.

Right out of the box, *NetWare 3.11* provides limited connectivity between

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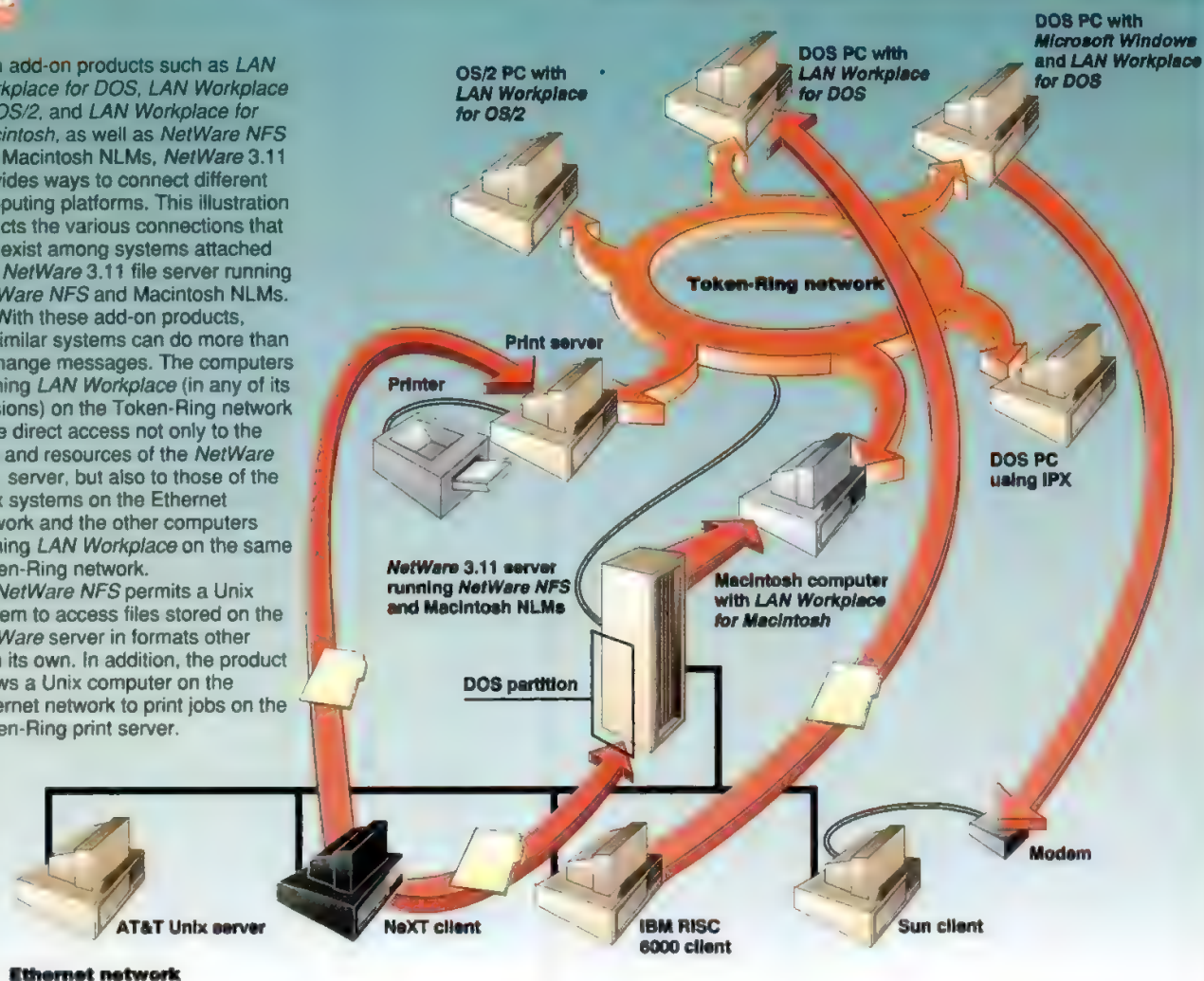


NETWARE MULTIPLATFORM CONNECTIVITY

With add-on products such as *LAN Workplace for DOS*, *LAN Workplace for OS/2*, and *LAN Workplace for Macintosh*, as well as *NetWare NFS* and *Macintosh NLMs*, *NetWare 3.11* provides ways to connect different computing platforms. This illustration depicts the various connections that can exist among systems attached to a *NetWare 3.11* file server running *NetWare NFS* and *Macintosh NLMs*.

With these add-on products, dissimilar systems can do more than exchange messages. The computers running *LAN Workplace* (in any of its versions) on the Token-Ring network have direct access not only to the files and resources of the *NetWare 3.11* server, but also to those of the Unix systems on the Ethernet network and the other computers running *LAN Workplace* on the same Token-Ring network.

NetWare NFS permits a Unix system to access files stored on the *NetWare* server in formats other than its own. In addition, the product allows a Unix computer on the Ethernet network to print jobs on the Token-Ring print server.



computers running TCP/IP software. For example, Unix systems on one *NetWare* network can send mail and messages to Unix machines attached to the same network or to a remote *NetWare* server; they can even use printers attached to those machines. But the built-in TCP/IP functionality does not allow Unix machines to access files stored in other formats on the *NetWare* server, nor does it allow diverse platforms to exchange files directly. *NetWare 3.11* includes a program that runs in a server and allows it to function as a local or remote IP router. The server can look inside the Ethernet packets or Token-Ring frames it receives, examine the IP address of the destination station, and make decisions about how to send the packet or frame toward the destination.

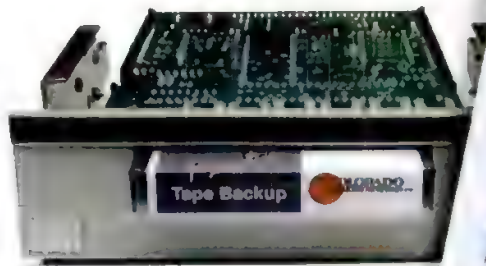
This capability is handy in organizations that have an eclectic base of computers that use the same network cabling scheme, with some using network software that supports Novell's IPX protocol, others using software that conforms to the IP standards. Imagine a NeXT computer running Unix and using network software that conforms to TCP/IP. If that computer is connected to the same Ethernet cable as a *NetWare 3.11* server, the *NetWare* server will transparently allow data from the NeXT machine to move over a long-distance internetwork link to another NeXT workstation (also attached to a *NetWare* server) located on a Unix network in another city. *NetWare*'s router transmits the IP packets to the remote network, allowing the two computers to work as if

they were in a Unix-only environment.

The more important method of integrating *NetWare* with TCP/IP involves invisibly moving *NetWare* packets across an existing IP-based network. Organizations with IP routers, or with connections to a routing internetwork system, can take advantage of a technique called *IPX tunneling*, which lets *NetWare* clients and servers interact across existing IP networks. IPX tunneling wraps IPX packets in a TCP/IP envelope so that IP routers can send the packets to different LAN segments. This technique gives *NetWare* systems the key to the international TCP/IP communications transportation systems already established by many companies, universities, and governmental organizations. Of course, *NetWare*'s ROUTEGEN

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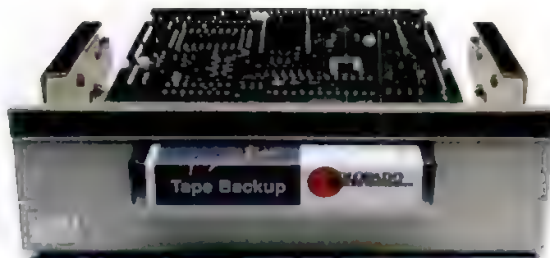


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CONNECTIVITY NETWARE 3.11

(incorrectly named BRGEN in earlier versions) is still available to allow IPX packets to be directly transmitted between *NetWare* networks when a direct link between the two exists.

Novell has implemented IP routing functions well, but its router lacks a trusted RIP (Routing Information Protocol) source list, which is found in most dedicated routers. Without this, the router

might get incorrect information from another router. Inadvertent and wrong RIP requests, although unlikely, could create never-ending work for the router or even crash the network.

One feature that network managers will appreciate is Reverse Address Resolution Protocol (RARP). RARP allows

you to put the LAN adapter's Ethernet or Token-Ring address and the IP address in a table on the router. Any network node can then query the router for its own IP address.

In the TCP/IP world, Simple Network Management Protocol (SNMP) allows many dissimilar hosts such as NeXT, RS/6000, and Sun systems to report statistics to each other. *NetWare* 3.11 includes an NLM manager, TCPCON, that queries TCP agents on the network cable, requests information about their status, and displays the data on the server console in familiar C-Worthy-style screens. TCPCON is not exactly a robust SNMP manager—it queries only one host at a time—but it provides useful information about network activity.

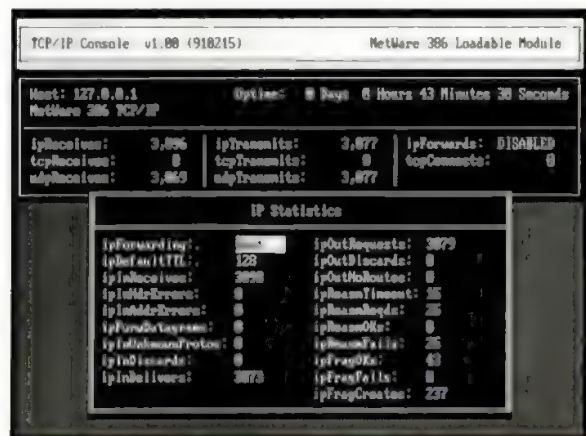
Novell also markets *TCP/IP Developer's Toolkit*, a package that allows developers to write TCP/IP-fluent applications for *NetWare* 3.11. The DOS version costs \$595.

NETWARE NFS INTEROPERABILITY

NetWare NFS is a \$4,995 collection of NLMs that allows Unix users who are attached to the same network cable to access the directory and print services on a *NetWare* 3.11 server. These NLMs run in the server and provide NFS services through Unix daemons (routines that run as a background process and perform system-wide public functions) for file sharing, print services, TCP/IP file transfers, file locking, and record locking.

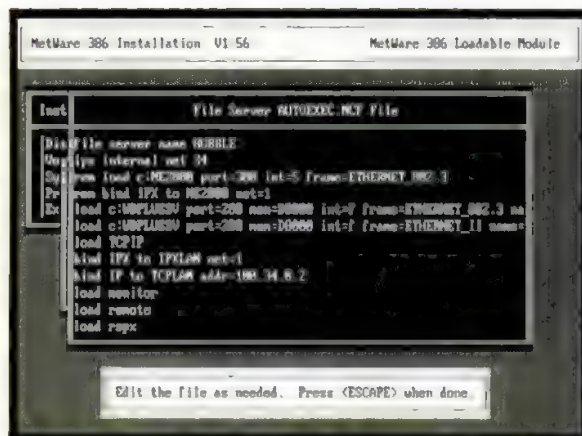
With *NetWare NFS* running on a *NetWare* 3.11 server, *NetWare* file and print servers emulate their Unix counterparts as they interact with attached Unix computers. This allows authorized Unix users access to *NetWare* print queues and file services, and makes volumes on the *NetWare* server appear just as they would on a native Unix file system. Unix users can also access files stored on the *NetWare* server from other file systems, including DOS, Macintosh, and OS/2 HPFS.

Because Unix and DOS store data differently, however, sharing files can lead to problems. Unix stores data with only a carriage return (13h) at the end of a line, while DOS uses a carriage return (13h) and a linefeed (10h). *NetWare NFS* includes two utilities to convert files to and from Unix and DOS, but they leave you with two copies of a file, and the loss of data integrity could spell trouble. Many

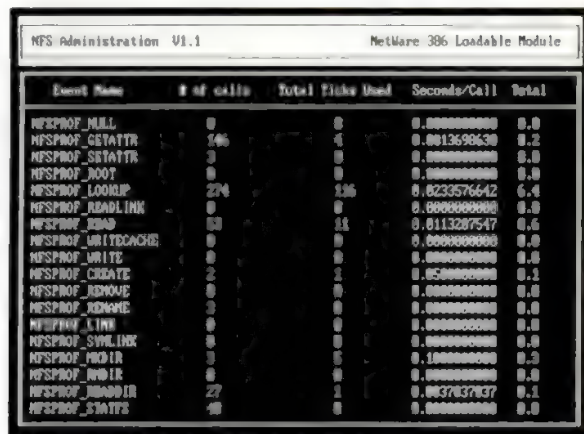


TCP/IP support at the server heads the list of *NetWare* 3.11's significant features. The latest version of the network operating system provides limited connectivity with other computers running TCP/IP software. The TCP/IP Console window in *NetWare* 3.11 shows general TCP/IP statistics, while the IP Statistics window below it displays detailed IP information.

When setting up your *NetWare* network, you can name your file server, comment out unwanted lines, making them inactive, and run IPX and IP over one network interface card. To set up multiple protocol stacks, load two different Ethernet frame types and bind the protocols to the network interface card with a network number and IP address.



The NFS Statistics option in the NFSADMIN utility displays the number and type of NFS calls made to the *NetWare* 3.11 server and the amount of time it took to satisfy them.



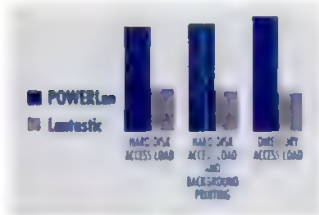
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May 28, 1991
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BYTE, March 1991

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people believe the network operating system should solve this problem, but for compatibility and transparency, applications really should handle the conversion themselves. *WordPerfect* is an excellent example of a program that does.

We used *NetWare NFS* to share *WordPerfect* files between *WordPerfect* running under Unix on a NeXT computer and the DOS version of the program. Since *WordPerfect* maintains compatibility with its data files across operating systems, on the NeXT workstation we were able to modify a file created with the

DOS version and send it to a remote PC workstation's QMS PostScript printer through a *NetWare* 3.11 print queue. This demonstrates cross-platform computing at its best.

In our experience, the only problem with *NetWare NFS* is that its automatic installation program is not really automatic. But the product's excellent documentation makes it easy to edit the AUTOEXEC.NCF file manually and get things started.

LAN WORKPLACE FOR DOS

Novell's *LAN Workplace for DOS* lets DOS and *Microsoft Windows* computers attached to a *NetWare* 3.11 server take advantage of TCP/IP connectivity. Without *LAN Workplace for DOS*, DOS client PCs cannot use the resources available from Unix systems on the same network cable. With it, DOS-based PCs on the *NetWare* network can act as terminals to the Unix system, exchanging files with it and using other resources attached to it such as CD-ROM drives, modems, printers, and tape backups. *LAN Workplace for*

CONNECTING TO OTHER PLATFORMS: Three Solutions for Interoperability

by M. Keith Thompson

In the future, the key to successful computing will be connecting PCs to many different types of computers. In many ways, the future is now. Novell's *NetWare* 3.11 and its *LAN Workplace for DOS* offer solutions to this challenge. And despite some technical hurdles, other enterprising companies have found creative ways to make connections happen today. Some of the most popular methods are *PC/TCP Plus* from FTP Software, *ProLINC* from Hughes LAN Systems, and *3+Open Connection for NetWare* from 3Com Corp. These products provide the features needed to share data and execute programs on multiple computer platforms.

FTP Software's *PC/TCP Plus* package offers connectivity with up to ten host Unix and IBM 3270 sessions from DOS and OS/2 PCs. Using *PC/TCP*'s TelNet functions, PCs can emulate DEC VT220 or IBM 3270 terminals over the network cable so they can run Unix or 3270 programs or use resources connected to those types of systems.

In addition, *PC/TCP* acts as an SNMP (Simple Network Management Protocol) agent, responding to requests for information about network status. *PC/TCP* for DOS costs \$400 per node, while the OS/2 version sells for \$575. If you are using *NetWare*, you can load *PC/TCP* on top of *NetWare*'s IPX program to give you connectivity beyond your *NetWare* network.

ProLINC allows the broadest range

of connectivity, giving DOS and *Windows* users a choice among multiple standards, protocols, and PC networks. With Hughes's Multiple Protocol Architecture (MPA), users can connect simultaneously with three hosts using DEC LAT, IBM DLC, *LAN Manager* NetBIOS, *NetWare* IPX/SPX, NFS, TCP/IP, or *VINES* IPC over Ethernet or Token-Ring.

Hughes's MPA is similar to 3Com's Demand Protocol Architecture (DPA) since it loads and unloads the protocols as necessary to communicate with other hosts. This prevents RAM shortages in the PCs and lets users connect with other computers without knowing what happens beneath the surface. *ProLINC* costs \$450 for a single user and \$8,750 for up to 25 users.

3Com's *3+Open Connection for NetWare* uses DPA to let PC network nodes access NetBIOS-based *LAN Manager* and *NetWare* networks simultaneously. With *3+Open Connection for NetWare* installed, users can run programs designed for *NetWare* that use IPX/SPX calls alongside NetBIOS programs that communicate with *LAN Manager* servers. Users simply assign a drive letter to their *NetWare* volume and access it as if it were any other network drive. *3+Open Connection for NetWare* costs \$250 for one user, \$995 for ten users, and \$2,195 for a server license.

As customers demand more connectivity, application programs and network operating systems will meet the challenge. The solutions described

above offer a sample of things to come. The primary limitation today is a shortage of available memory on workstations. But with memory management solutions on the rise, the client PCs of tomorrow won't have to worry as much about DOS's memory constraints, thus letting them communicate with as many hosts as necessary. ■

PC/TCP Plus, Version 2.05

FTP Software Inc., 26 Princess St., Wakefield, MA 01880; 617-246-0900.
List Price: For DOS, \$400 per node; for OS/2, \$575 per node; 20-user site license, \$3,500.

Requires: PC-XT or better; 70K RAM; hard disk; DOS 2.1 or later, or OS/2 1.1 or later (EE or standard).

CIRCLE 407 ON READER SERVICE CARD

ProLINC, Version 2.0

Hughes LAN Systems Inc., 1225 Charleston Rd., Mountain View, CA 94043; 800-395-5267, 415-966-7300.

List Price: 1-user version, \$450; 25-user version, \$8,750.

Requires: PC-XT or better, DOS 3.1 or later, 80K RAM.

CIRCLE 408 ON READER SERVICE CARD

3+Open Connection for NetWare

3Com Corp., 5400 Bay Front Plaza, Santa Clara, CA 95052-8145; 800-638-3266, 408-764-5000.

List Price: 1-user version, \$250; 10-user version, \$995; server license, \$2,195.

Requires: 640K RAM, DOS 3.3 or later, network adapter with NDIS driver.

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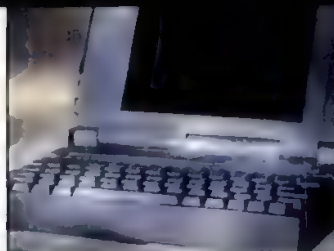
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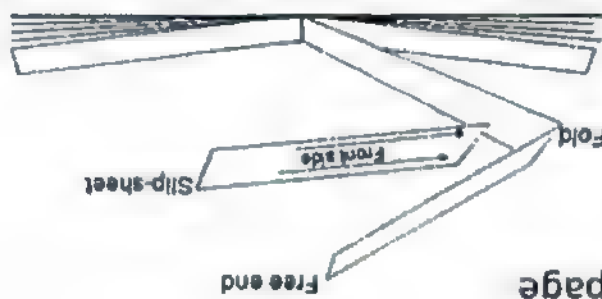
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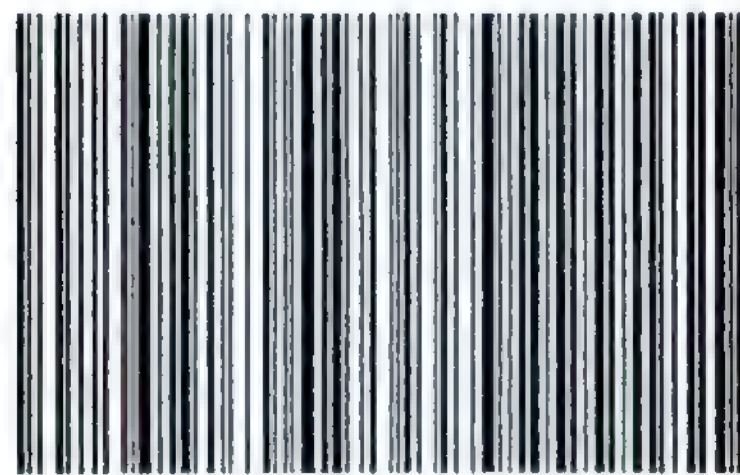
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Inverted Foldout slip-sheet

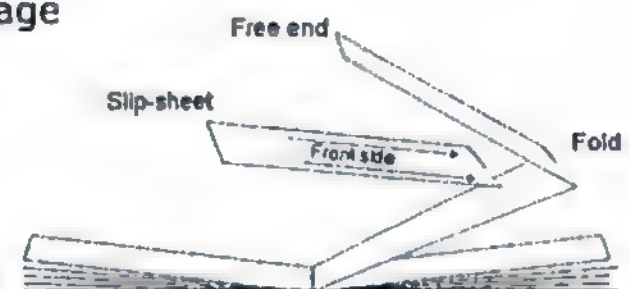


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Foldout slip-sheet

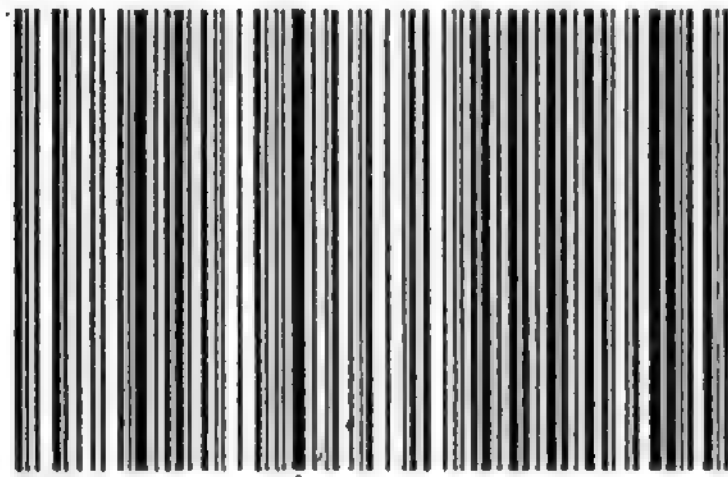
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1. Follow instructions on the other side

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Gbs5lipBack-001B

Back

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DOS even lets you turn your PC into an FTP (File Transfer Protocol) server, giving Unix computers access to DOS systems' hard disks. With this software in place, Unix systems can access the DOS machines' files, but without *NetWare NFS*, they cannot use any of the other DOS-based clients' network printers.

At \$450 per PC, however, *LAN Workplace for DOS* is pricey. Novell also markets *LAN Workplace* products for OS/2 and Macintosh computers, at \$495 and \$250, respectively.

To take advantage of this kind of connectivity, you need to select the ODI (Open Data-link Interface) drivers available only to *NetWare 3.11* during the workstation generation process, WSGEN. This allows *NetWare* to use multiple protocol stacks on the same adapter at the same time. With both protocols loaded (IPX/SPX and TCP/IP), a PC can talk to both networks simultaneously. More importantly, you can unload the ODI drivers from memory when you have finished your connection, returning precious RAM to applications.

LAN Workplace for DOS works well when you are running either DOS or Windows. In DOS mode, you get a command line interface. Icons and support for multitasking and DDE are characteristics of the Windows version included in the *LAN Workplace for DOS* package.

MACINTOSH SUPPORT

Novell has finally eliminated the need to use a *NetWare 2.x* "bridge" (actually a router) to provide a path for Macintosh computers to access *NetWare 3.11* file services. *NetWare 3.11* now supports Macintosh computers with AppleTalk Filing Protocol (AFP) through optional NLMs on the server. A *NetWare 3.11* server can even route among LocalTalk, EtherTalk, and TokenTalk in the same server, providing connectivity to several normally isolated LANs. LocalTalk is Apple's network hardware, while EtherTalk and TokenTalk are versions of AppleTalk that run over Ethernet and Token-Ring topology.

The Macintosh name space provides a native file-storage area on *NetWare 3.11* servers. Using Apple Computer Corp.'s *AppleShare*, Macintosh users can access *NetWare* file servers with Chooser, a built-in menu function on the Mac, and find information stored on the *NetWare* server by selecting familiar Macintosh icons.

We recently ran into an interesting problem with Novell/Macintosh integra-

CONNECTIVITY NETWARE 3.11



NETWARE 3.11 AND NETWARE 2.2: SUMMARY OF FEATURES

Products listed in ascending price order

The latest editions of *NetWare*—Version 3.11 and Version 2.2 (a merger of the *Advanced*, *ELS*, and *SFT NetWare* products)—offer an array of features. Of course, *NetWare 3.11* generally provides increased functionality over *NetWare 2.2*. In terms of security, however, both can use group membership to determine resource access, send encrypted passwords over the network, grant access by level, and allow access control by time and date. On the printing end, both products handle spooling, allow downloading of fonts, and let users modify the print queue. Additionally, *NetWare 3.11* and 2.2 provide administrative features that include keeping an error/status log, maintaining accounting data by user or resource, reporting the number of bad packets and network errors, and monitoring open files. Each program shows the names of users logged on.

	NetWare 2.2	NetWare 3.11
List price	\$5,495	\$12,495
GENERAL INFORMATION		
Maximum number of users	100	250
Processor required in server	80286 or better	80386 or better
Dedicated server required	☐	☒
Peer-to-peer resource sharing	☐	☐
SERVER SOFTWARE		
Required RAM	500K	1MB
Recommended RAM	2.5MB	6MB
Allows disk caching	☒	☒
WORKSTATION SOFTWARE		
Required RAM	70K	70K
Recommended RAM	640K	640K
FILE SYSTEM		
Concurrent open files per server	1,000	100,000
Volumes per server	16	Unlimited
Physical drives per volume	1	32
Physical drives per server	32	2,048
Files can span multiple drives	☐	☒
Maximum file size	256MB	4GB
Maximum volume size	255MB	32TB
Maximum physical RAM	12MB	4GB
Maximum disk storage	3GB	32TB
ADMINISTRATION		
Remote console over network cable	☐	☒
Remote console over modem	☐	☒
PROTOCOLS SUPPORTED		
AFP (Apple Filing Protocol)	☒	☒
IPX/SPX	☒	☒
NetBIOS	☒	☒
OSI (Open Systems Interconnection)	☐	☒
TCP/IP	☐	☒
FILE SYSTEMS SUPPORTED		
Macintosh	☒	☒
NFS	☐	☒
OS/2 HPFS	☒	☒

■ — Yes □ — No

MB—megabyte, GB—gigabyte, TB—terabyte



BENCHMARK TESTS: NETWARE 3.11 AND NETWARE 2.2

NetWare 3.11 provides consistently faster throughput than NetWare 2.2 on both Token-Ring and Ethernet media. The difference isn't great under light loads, but when 31 stations are pushing and pulling data through the server, the greater data-handling efficiency of NetWare 3.11 can provide increased throughput.

The **Workstation Throughput Evaluation** test reports the throughput recorded on a single PC during the performance of a standardized task on the network, and is run in conjunction with the Hard Disk Access Load test, the Hard Disk Access Load with Background Printing test, or the Directory Access Load test. The test program performs a sequential read, a random read, a sequential write, and a random write using a 1MB file. The record size systematically rotates among 16K, 4K, and 512 bytes. The throughput is reported in megabits per second.

The **Hard Disk Access Load** test reads random blocks of data in 1K increments from a 10K file on the server. The results of this test are reported in requests per second for all the PCs running the load test. The test begins and ends at the same time as the Workstation Throughput Evaluation test.

The **Directory Access Load** test makes the server repeatedly search for a nonexistent file. Since the file allocation table in most network servers is typically cached, this request causes a fast read to the cache. The repeated retries created by the client PCs generate a heavy load on the server's CPU. This test provides a general-purpose method of loading the server's CPU in the fashion of a resident task, such as a network-monitor program or a communications program. The results for this test are reported in requests per second for all the PCs running the load test. The test begins and ends at the same time as the Workstation Throughput Evaluation test.

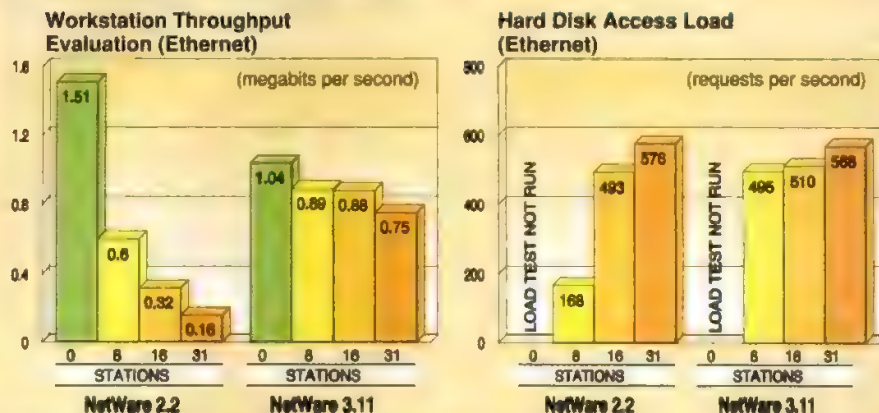
The **Hard Disk Access Load with Background Printing** test uses the same setup as the Hard Disk Access Load test, but it adds the load of a large network print job that constantly spools to a printer attached to the file server. The size of the print job is adjusted to keep it feeding to the printer throughout the load and throughput tests. The test begins and ends at the same time as the Workstation Throughput Evaluation test.

WHAT THE NUMBERS MEAN

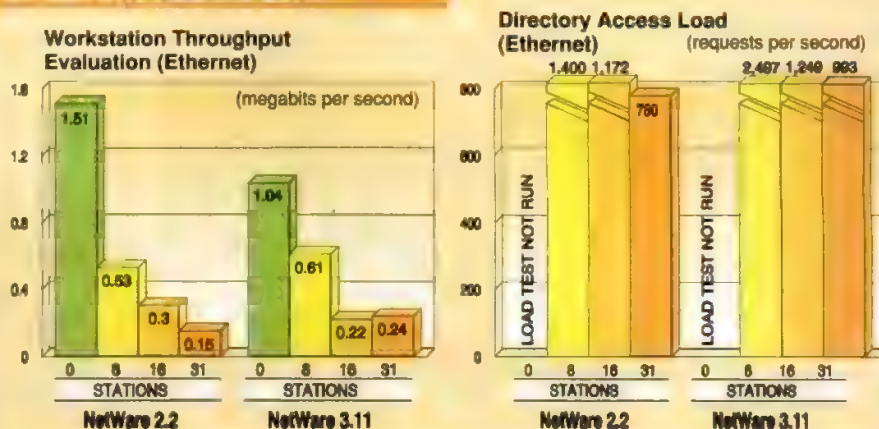
Performance in LAN operating systems is determined primarily by two factors: high-quality transport-layer software and a good disk-cache system. Novell designed its IPX to move small data blocks quickly. The cache system, particularly in NetWare 3.11, benefits from years of improvements.

The main conclusion you can draw from the test results is that *NetWare*, Version 3.11, can handle increased network activity better than *NetWare*, Version 2.2. This is particularly true for activities that stress the server's

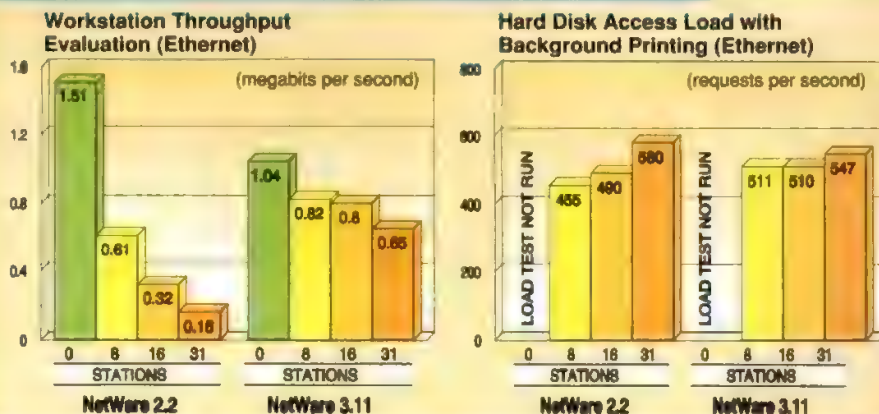
HARD DISK ACCESS LOAD



DIRECTORY ACCESS LOAD



HARD DISK ACCESS LOAD WITH BACKGROUND PRINTING



processor, such as printing and checking the RAM cache. With over 300 simulated stations moving data to and from the server and a print job in process, *NetWare 3.11* had a throughput of about 650 kilobits per second over Ethernet, while *NetWare 2.2* could provide only 160 Kbps under the same conditions. 650 Kbps is acceptable to people loading files, while 160 Kbps is generally not acceptable.

The slower throughput for both *NetWare 3.11* and 2.2 over the Token-Ring network was caused primarily by the slower signaling speed of Token-Ring. It is likely that the more complex protocol stacks and adapter activity of

Token-Ring is also responsible for the slower recorded times.

Keep in mind that whether using Token-Ring or Ethernet, both versions of *NetWare* had throughput decrease by about 80 to 85 percent between the lightest and heaviest loads. Also note that these test results do not show the flexibility and added value you gain from the multiple protocols and *NetWare* Loadable Modules available in *NetWare 3.11*. These features are more important than throughput for purchasing decisions.

HOW WE TESTED

We ran the PC Magazine LAN Labs benchmark tests using both twisted-pair Ethernet and 4-megabit-per-second Token-Ring topologies. We used a 25-MHz Compaq Deskpro 386/25e with 16MB of RAM as the server for all tests. The server was configured with Proteon's 1390 ISA adapter for the Token-Ring tests and with Novell's NE2000 ISA adapter for the Ethernet tests.

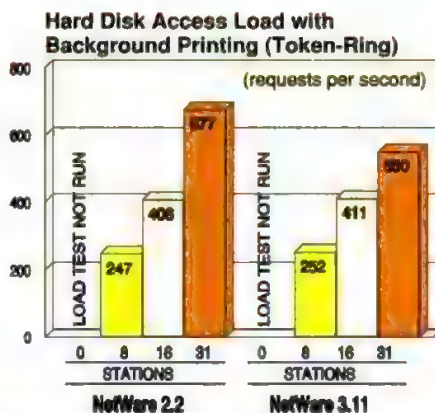
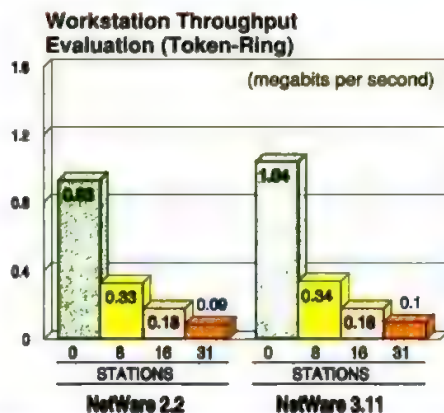
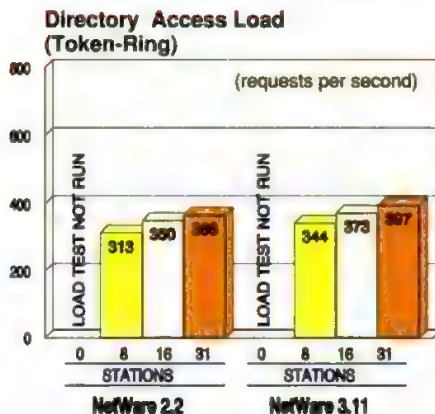
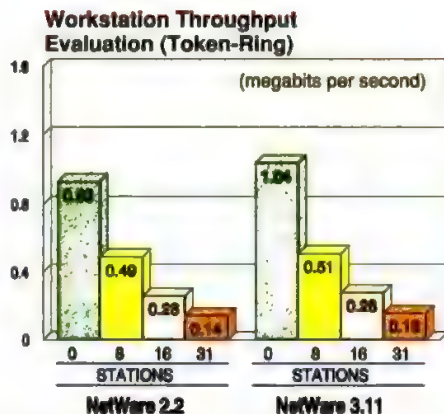
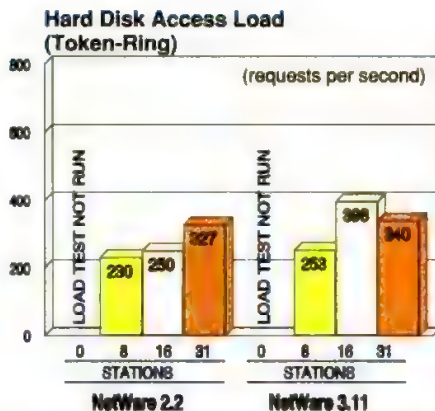
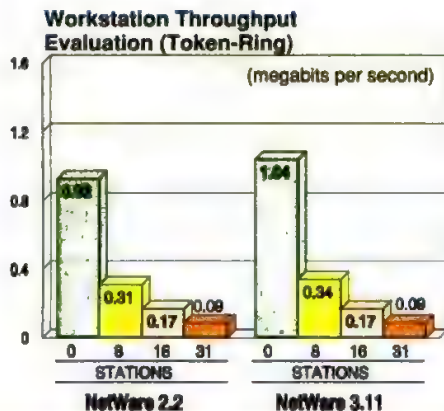
The test-bed consisted of 31 Compaq Deskpro/N 386SX-16 computers acting as load stations. Another Compaq Deskpro/N 386SX-16 acted as the single-node performance PC. The Workstation Throughput Evaluation test was run separately on that system. We synchronized that station with the activity of up to 31 other stations running the Hard Disk Access Load test, Directory Access Load test, or Hard Disk Access Load with Background Printing test in order to measure how much work the load stations can perform during the test, as well as the throughput of the single-node performance PC.

All these ISA-based computers were equipped with 5MB of RAM. They had Proteon's 1347 Token-Ring adapters for the Token-Ring tests and 3Com's Etherlink II adapters for the Ethernet tests.

The graphs juxtapose the scores on the Workstation Throughput Evaluation test and the scores on the load tests. This clarifies the relationship between the output of the PC running the throughput tests and the output of the stations running the load tests, as well as the overall work done by the network. We ran the tests with 0, 8, 16, and 31 stations.

PC LAN Labs' benchmark tests are written in C and are independent of commercial software. Each load station operates at a rate many times that of a PC, even one in a heavy-use environment. Since each workstation running the load tests simulates the activity of 10 to 15 PCs, the real effect on the network is something close to 300 workstations in operation.

(Taller bars represent better performance)



tion, however. All Mac users know that Apple recently released a new operating system called System 7. If you try to use System 7 in a Mac with a Novell Ethernet adapter present, the computer freezes. The fix is to get new drivers from Shiva Corp. Macintosh NLMs from Novell cost \$895 for 20 users and \$1,995 for 100 users.

FUTURE IMPROVEMENTS?

It would be helpful if Novell included support for NFS at the PC workstation with *NetWare NFS*, instead of requiring the purchase of an add-on product such as *LAN Workplace for DOS*. Now that *NetWare 3.11* includes optional support for NFS at the server, we would also like to see Novell support Server Message Block (SMB). This would give *LAN Manager* and other NetBIOS-based networks transparent connectivity to *NetWare* servers.

The final piece to the puzzle would be *NetWare's* ability to mount other NFSs at the server. This would allow all *NetWare* nodes, not just the one with *LAN Workplace*, to access files on remote Unix systems. These additions would make *NetWare 3.11* the ultimate in cross-platform computing.

Meanwhile, for companies that want maximum compatibility across many platforms now, there's *NetWare FTAM* (\$4,995). Adhering to the Open Systems Interconnection (OSI) standard, File Transfer Access and Management (FTAM) allows dissimilar Unix computers to communicate at the file level. *NetWare FTAM* allows systems conforming to the seven-layer OSI model to exchange files with *NetWare 3.11* servers.

Unlike *NetWare NFS*, which makes remote files look like an extension to your computer, *NetWare FTAM* is designed to provide rudimentary file communication between hosts. Users are limited to sending, receiving, renaming, and deleting files from either system. *NetWare FTAM* is intended for organizations that need to transfer data frequently, not for cross-platform computing.

CURRENT BACKUP, SECURITY, AND MANAGEMENT OPTIONS

Now that you have access to more valuable data than you know what to do with, how do you back it up? Novell, in conjunction with Cheyenne Software, has developed a Backup and Restore application program interface that is included with *NetWare 3.11*. This API allows third-

party developers to customize their backup equipment to work with the latest version of *NetWare* without worrying about the particulars of the underlying operating system.

Novell also provides two simple backup programs to safeguard your data. NBACKUP includes a way to back up DOS and bindery data to a DOS workstation device, such as a Bernoulli Box attached to a node on the network. The newer SBACKUP operates in the server as an NLM and backs up the entire server, including data stored in the multiple name spaces. This is the most reliable and comprehensive method of backing up a *NetWare* server.

NetWare 3.11 also provides built-in system fault tolerance (SFT) through disk mirroring and duplexing. With disk mirroring, *NetWare* writes data to both disks attached to the same controller simultaneously. Disk duplexing allows

NetWare to write the same data to two drives running on different controllers.

The system also includes *NetWare Management Agent for NetView*. This group of NLMs enables a *NetWare 3.11* server with a Token-Ring adapter installed to forward *NetView*-specific alerts to an IBM host running *NetView*, an IBM network maintenance program.

NetWare 3.11 allows managers to control their networks without being at the file-server console. Using RCONSOLE over a network connection, or ACONSOLE over a telephone line with a modem, an administrator can remotely load and unload NLMs, mount and dismount volumes, and execute any command as if he were sitting at the file server.

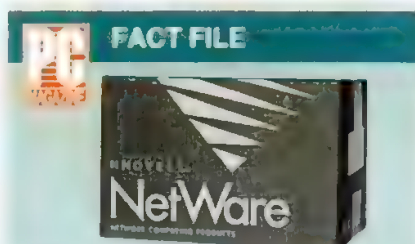
NetWare Name Service (NNS) is a new network tool that allows simple access to multiple *NetWare* servers. With *NNS*, servers are grouped into domains, and users login to a domain instead of a server. Administrators save time and effort by managing an entire domain instead of one server at a time, while users gain transparent access to resources anywhere on the domain. *NNS* is designed for *NetWare 2.x* and *3.1x* servers and costs an additional \$1,995 per company per country.

NETWARE 2.2: COMBINING THE BEST OF 2.x

Not everyone requires the kind of cross-platform connectivity and high-end networking that *NetWare 3.11* can supply. For the less demanding users, *NetWare 2.2* is a worthwhile option. By eliminating the different versions of its entry-level products, Novell offers an attractive and smooth upgrade path. *NetWare 2.2* provides an easy move up from a small 5-user *NetWare* server to a 100-user network. Prices start at \$895 for the 5-user version and climb through a \$1,995 10-user version and a \$3,495 50-user version up to \$5,495 for the 100-user version.

The most significant differences between Versions 2.2 and 2.15 occur in the installation area. The Basic Installation stage now takes a novice about an hour to complete, where once it would have taken many hours for an experienced user. You have to answer only three questions, feed the server 13 floppy disks, and reboot. The Advanced Install step allows more control over the installation. You can add print services to the file server and set I/O and IRQ settings for the network adapter and various disk drive options.

Both *NetWare 3.11* and *2.2* use the



Novell Inc., 122 E. 1700 South, Provo, UT 84606; 800-638-9273, 801-429-5900.

NetWare, Version 3.11

List Price: 20-user version, \$3,495; 100-user version, \$6,995; 250-user version, \$12,495. *LAN Workplace for DOS*, Version 4.0: 1-user version, \$450; 10-user version, \$1,995. *NetWare NFS*, \$4,995. *NetWare FTAM*, \$4,995.

Requires: 386SX-based PC or better, 4MB RAM, hard disk.

In Short: *NetWare 3.11* finally delivers on promises that Novell made for *NetWare 3.0*. Novell has done a very good job of integrating TCP/IP and NFS services into *NetWare*. With *NetWare 3.11*, Novell leads the way to interoperability.

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NetWare, Version 2.2

List Price: 5-user version, \$895; 10-user version, \$1,995; 50-user version, \$3,495; 100-user version, \$5,495.

Requires: 286-based PC or better, 2.5MB RAM, hard disk.

In Short: A much-improved and needed update to *NetWare 2.1x*, Novell's *NetWare 2.2* finally unifies the company's low-end products into a cohesive group. Users can now easily upgrade from a 5-user version to a 100-user version. The installation process is greatly simplified; the utilities have a more polished look and feel.

CIRCLE 411 ON READER SERVICE CARD

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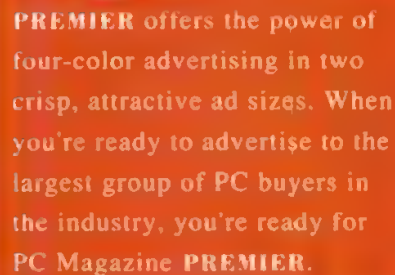
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WSGEN workstation generation program; it replaces SHGEN to create the IPX.COM program that communicates with the network interface card. WSGEN has a more streamlined command structure and is easier to use.

NETWARE 3.11 AND 2.2 PERFORMANCE

The raw performance speeds of a network operating system are not as important today as they were three years ago. Today's network operating systems operate within a few kilobits per second of each other, so the response time among smaller networks does not differ greatly. With larger-scale LANs, however, maintaining the same response time for 200 users as for 100 users is very important. This is where *NetWare 3.11* shines.

Our benchmark tests show that *NetWare 3.11* is capable of handling large amounts of traffic without taking a significant performance hit. On a network without any traffic, a *NetWare 2.2* server offers about 90 percent of the throughput of a 3.11 server. But once you add traffic to the network, *NetWare 3.11* performs about twice as fast as *NetWare 2.2*.

Despite rumors of *NetWare 3.11* having some initial problems, it seems to be working well in many different environments. Unfortunately, we were unable to get *NetWare 3.11* running reliably on our AT&T 6386/WGS. Many contacts with Novell support resulted in dead ends, yet the operating system works fine on our ALR, Core, and IBM systems. (There is one patch out for *NetWare 3.11*, fixing a bug in the PSERVER program.)

The reports of problems are all related to PCs with more than 16MB of RAM, particularly those with disk and LAN adapters that use 24-bit DMA (direct memory access) and are not related to any specific version of *NetWare 3.x*. The best solution is to use only 32-bit adapters in PCs with more than 16MB of RAM.

THE COMPETITION

In the world of high-end networks, *NetWare*'s two major competitors are still *LAN Manager* and *VINES*. *LAN Manager* currently does not provide any built-in connectivity to TCP/IP-based computers. *VINES* runs under Unix and is based on TCP/IP.

Microsoft's next release of *LAN Manager* will include support for TCP/IP as the primary protocol. This will allow client PCs to connect to *LAN Manager* servers and Unix TCP/IP hosts attached to the

CONNECTIVITY NETWARE 3.11

network cable, without the extra RAM overhead associated with multiple protocol stacks loaded simultaneously.

Since *VINES* runs under Unix, it provides the ultimate server-to-server TCP/IP connectivity. Users linked to a *VINES* server can access any other Unix computer on the network with ease. StreetTalk, *VINES*' global naming service, is another area where *VINES* has an advantage over *NetWare*. Through StreetTalk, network users can access resources on almost any networked PC without worrying about where it is located. Currently, *VINES* still provides the best wide-area communications among the three major players in the network operating-system market.

STILL THE CHAMP

Overall, *NetWare 3.11* is still the leader in network operating systems, with more software support than all the NetBIOS networks combined. Companies still clamor to have their hardware Novell-certified (see the sidebar "NetWare Certification: A Seal of Approval, but for How Long?"). At the same time, Microsoft's *LAN Manager* and IBM's *LAN Server* are gaining acceptance with large organizations, so Novell must continue to enhance *NetWare* to maintain its leadership position.

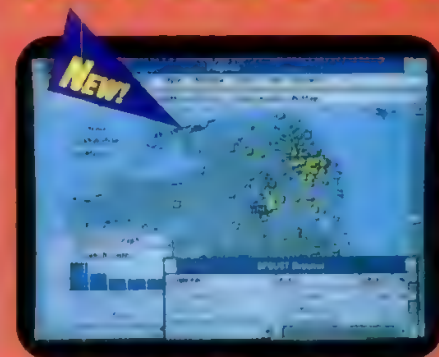
NetWare 3.11's many new features offer benefits, but with a steep price tag. Through its TCP/IP implementation, Novell created an attractive product and came through with the functions the market required. If you need the connectivity and can afford it, *NetWare 3.11* with *NetWare NFS* and *LAN Workplace for DOS* is a good solution.

At the same time, *NetWare 2.2* represents a giant step forward for users. Simplified installation, enhanced utilities, and a smoother upgrade path make *NetWare 2.2* a much-improved product. If you currently have 2.x and you don't need the power of *NetWare 3.11*, you should definitely upgrade to 2.2.

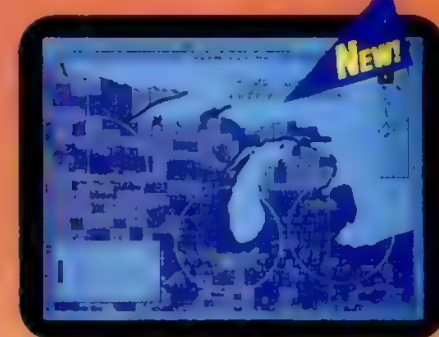
Besides performance and features, some of the most important factors to look for in a network operating system are reliability, software support, and service. With its well-known name and established reputation, Novell offers all of these with both versions of *NetWare*.

M. Keith Thompson is a frequent contributor to PC Magazine.

SEE YOUR DATA!

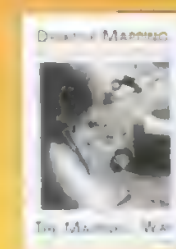


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P6-PC

CIRCLE 122 ON READER SERVICE CARD



After almost a year in the hands of *PC Magazine's* staff, last year's 14 printer-issue Editors' Choice winners are still going strong.

HOW THEY HELD UP: Printer Endurance Tests

On *PC Magazine's* hardware team, years are measured from November to November—or from printer issue to printer issue. Last year's was one of our biggest yet: 121 laser, ink jet, and dot matrix printers reviewed under one cover with accompanying guides, benchmark tables, in-depth section introductions, and product sidebars.

This year, we assigned each of last year's Editors' Choice winners to one *PC*

BY OLIVER RIST

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Magazine staffer for an in-depth eight-month endurance test. We used varied interface connections, printed on all types and sizes of paper, got inside the case for cleaning and replacing consumables, and tried as many add-on attachments as we could.

In the process, we encountered all the usual problems caused by daily wear, tear, and abuse. We drugged through paper jams, faulty drivers, cryptic error messages, inexplicable design flaws, a toner spill, and even one self-destructing print head (on the NEC Pinwriter P6200).

On the laser-printer front, we examined the standard-setting HP LaserJet III and HP LaserJet IIID, and the tremendously upgradable IBM LaserPrinter E. Our associate graphics director ran countless complex graphics through NEC's low-price PostScript-compatible NEC Silentwriter 2 90. We even managed to lug the weighty QMS PS-2210 into our offices. Publishing director Bill Machrone stuffed

ENDURANCE TEST

PRINTERS

the Canon BJ-10e into his briefcase. We distributed the HP DeskJet 500, the Epson LQ-850 and LQ-1050, the NEC Pinwriter P6200 and P6300, and the Citizen 200GX and GSX-140 printers as steady desktop companions in various areas throughout our editorial offices.

WHAT HAPPENED LAST YEAR

We dubbed 1990 the year of the scalable font printer. Indeed, last year's printer market was dominated by Hewlett-Packard Co.'s introduction of the HP LaserJet III, HP LaserJet IIID, and its own PCL 5 printer language, which supports scalable fonts, bit-image compression, and the HPGL plotter language. Many people thought it was a mistake to buy anything but an HP in 1990. But even while this was going on, more competitively priced personal laser printers were being introduced than ever before. And indeed, three non-HP laser printers won Editors' Choice awards.

Other big news last year came from the ink jet sector in the form of the tiny Canon BJ-10e. The Canon's incredibly small size (2.2 by 12.3 by 8.5 inches and only 4 pounds!) was part of its success, but what really put it over the top was that neither its features nor its performance were lacking, despite the dimensions. Although a little slower than its ink jet competition, the little Canon fully kept up in the print-quality department.

WHERE ARE THEY NOW?

This year's printer issue will have more exciting developments; you can read all about them in November. You will also see how every new printer on the market stacks up against the others in price, performance, and features. This issue's story tells you how the best printers of 1990 withstood the ultimate product tests: age and steady, grueling use.

CANON USA INC.

Canon BJ-10e

by Bill Machrone

I swore I'd never carry a portable printer. They're too heavy, too bulky, too unnecessary. Then I met the Canon BJ-10e. At 4 pounds (6 pounds with battery pack and AC adapter), the \$495 BJ-10e is lighter

The BJ-10e produced
big, black type on
normal paper instead of
that thermal garbage.

and smaller than many laptops. In fact, people have mistaken it for a computer on several occasions. I don't carry it every day—far from it. But I've thrown it into my suit carrier half-a-dozen times in the last several months. Its diminutive size and big-league capabilities made it the hero of the hour for presentations, putting finishing touches on speeches, and the convenience of having hard copy on the road. I won't take it on every business trip, but it sure is nice to know that I can.

PRINTING ON THE ROAD

Quality printing on the road is a treat. I've long advocated using electronic mail to fax things to yourself at a hotel or business when you need hard copy. But you usually cannot control print quality and type styles. The BJ-10e produced big, black type, widely spaced and readable, on normal paper instead of that thermal garbage.

The print quality is every bit as good today as it was the first day I used the BJ-10e. Nothing has fallen off, broken, or shown any signs of wear, tear, or travel. The print mechanism's 360-dpi ink-jet technology looks best on paper with short fibers that do not wick the ink and cause blurring. I keep about 50 sheets of the good stuff in the BJ-10e's nylon travel case. Seeing the output, people always ask, "Did you do this on a laser?" Ink-jet ink has also come a long way. The BJ-10e's ink does not smear, even when it gets wet. It dries almost instantly as the line being printed clears the printhead.

I have the optional sheet feeder but rarely use it. The manual paper feed and top-of-form alignment are nearly fool-proof. Also, with a LaserJet at home, I have a printer for multipage documents, so I've used the BJ-10e to print on objects of odd shapes and sizes. How about a heart-shaped invitation? A die-cut book-mark made from 80-lb. stock? The BJ-10e takes them in stride, especially if you use a backing sheet to fool the paper-out sensor. The BJ-10e's ability to handle these special short-run print jobs is a surprising

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THE PLUS IS 16PPM SPEED.

Twice as fast as traditional printers, the Kodak Ektaplus 7016 printer can make you at least twice as productive. It maintains fast, high-quality throughput, even when printing Adobe PostScript language. It helps you get more done in a day.

THE PLUS IS A COPIER.

Imagine the convenience of having a built-in copier for those frequent one- or two-copy jobs! The Kodak Ektaplus 7016 printer comes standard with a 6 pages-per-minute convenience copier that keeps everybody on the job instead of on the run. For the name of the dealer nearest you, call 1 800 344-0006, Ext. 456.



THE PRINTER WITH A PLUS. KODAK

Kodak Ektaplus 7016 printer



WITH CITIZEN, THE ONLY THING MORE POWERFUL THAN MY PRINTER IS MY DOCUMENT.



From spreadsheets to data sheets to high-impact documents complete with color, the Citizen GSX-140 PLUS gives you everything you need in a 24-wire printer.

Designed for just about any application, the Citizen GSX-140 PLUS is one of the fastest printers in its class. And one of the easiest to use, too. With Command-Vue™, you're in control of color, pitch, eight different fonts, page layout and more. All at the touch of a button.

Color is just that simple, too. Add impact and memorability to any document with the color software you already own. Simply snap in the optional Color On Command™ kit.

The GSX-140 PLUS actually remembers the software programs you use most often. All you do is push a button and the Citizen will prepare any one of four page layouts automatically. It handles

paper effortlessly, too, with continuous paper tear-off that instantly advances the next page to the tear-off bar. And thanks to paper parking, you can easily switch between continuous paper and single sheets.

At Citizen, our goal is to build the best printer for the best value. That's why we include the Citizen Pledge of Quality – a two-year warranty. The Citizen GSX-140 PLUS. It puts power at your fingertips. For more information call 1-800-556-1234 ext. 34.

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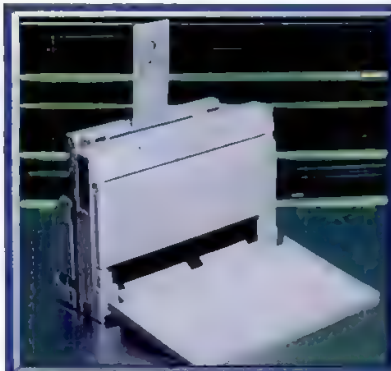
 **CITIZEN™**

CIRCLE 318 ON READER SERVICE CARD.



ENDURANCE TESTS

PRINTERS



CANON BJ-10E

Last Reviewed: March 12, 1991, page 306.
Reason Selected: Editors' Choice (November 13, 1990).

Positive Findings: Excellent print quality, small, light, quiet operation. Portability without compromises.

Negative Findings: No control instructions printed on inside cover; no AC cord for power cube; inconvenient charging of optional battery.

RELIABILITY

PRINT QUALITY

PERFORMANCE

and welcome addition to its capabilities. The IBM Proprinter X24 emulation has been flawless. I've printed a wide range of graphics and display fonts—everything, in fact, except the standard typefaces.

POWER CONCERNS

My BJ-10e has the optional nickel cadmium battery pack, which can run the printer for about an hour. Charging the battery is a pain in the neck; it requires you to hold down an odd combination of control buttons as you turn on the power switch. The battery does not charge when the BJ-10e is operating or just plugged in.

Another negative is the power cube, which hangs in a wall outlet. Power cubes hog outlets and make it difficult or impossible to plug in other devices. Also, the shape of the power cube does not lend itself to easy portability, especially with the metal power prongs sticking out of the plastic block, trying to rip holes in your luggage. A better solution would have been to have a short AC cord on one side, and the existing long DC cord on the other.

This notwithstanding, the BJ-10e has withstood the tests of time, hard use, and portability. It's good enough for light office printing, especially if you have a laser printer on the LAN. If you do not need multipart forms, there's no reason to choose a dot matrix printer over this one.

Canon BJ-10e

Canon USA Inc., Information Systems Division, 1 Canon Plaza, Lake Success, NY 11042; 516-488-6700.

List Price: \$495; cut-sheet feeder, \$90; nickel cadmium battery pack, \$50.

Standard Warranty: One year on parts and labor.

Dimensions (HWD): 2.2 x 12.3 x 8.5 in.

Weight: 4 lbs.

Emulations: Canon BJ-130e, IBM Proprinter X24.

CIRCLE 602 ON READER SERVICE CARD

CITIZEN AMERICA CORP.

Citizen 200GX

by Margaret A. Piemonte

At \$299, the nine-pin, narrow-carriage, color-capable Citizen 200GX proved to be the perfect choice for the novice user. Its competitive price, ease of use, and user-friendly options make the 200GX well-suited for either a small business or a home office.

EXCELLENT PAPER HANDLING

The 200GX's automatic paper-loading feature sees to it that the only time you need touch the paper is during the loading and tearing stages. *Paper jamming* is a

phrase that nobody likes to associate with a printer, but it does happen. There is no need for it to become a horror show.

By switching the paper-select lever, you can print on single sheets of paper or envelopes without removing the continuous feed. The automatic tear-off feature frees you from the burden of having to use the knob to adjust the paper every time you tear off a page. An optional \$49 printer stand allows bottom feeding with a straight paper path for labels and multipart forms. The only inconvenience with loading the labels is ensuring that they are placed all the way to the left to catch onto a lever on the bottom, so the printer will recognize them. It was difficult at times to see if the labels were loading properly through the bottom. Citizen is working on stating this point more clearly in the manual.

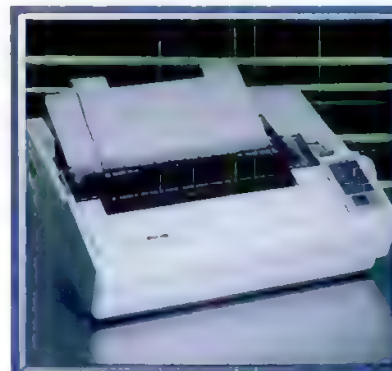
A COLORFUL FEATURE

Citizen offers an optional \$59 color kit that includes a four-color ribbon and a special motor to handle it. With the 200GX, printing in color is not as intimidating as you might think. I did have to change one of the DIP switches; you should also remember that only certain Epson emulations will allow you to print in color. You can print color text just by setting it on the command panel, or by using software such as *WordPerfect*.

The 200GX became one of my desk's vital accessories, along with the phone and pens. I hated to say good-bye to my color output, my label printing, and the ability to have all the paper-handling features I need in the convenience of my office.

Citizen 200GX

Citizen America Corp., 2450 Broadway, #600, Santa Monica, CA 90404-3060; 213-453-0614.



CITIZEN 200GX

Last Reviewed: November 13, 1990, page 360.

Reason Selected: Editors' Choice.

Positive Findings: Easy paper handling, small footprint, good color printing, useful documentation.

Negative Findings: Slightly noisy, small selection of fonts.

RELIABILITY

PRINT QUALITY

PERFORMANCE

People are always looking for
affordable ways to make a better impression.



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The new LaserJet IIIP printer features HP's exclusive Resolution Enhancement technology. An innovation that provides 300 dpi print quality superior to that of ordinary laser printers. The PCL5 printer language, with font scaling and HP-GL/2, brings even more to your documents.

Fourteen bit-mapped and eight internal scalable typefaces give you thousands of options. And, to make things even more interesting, the LaserJet IIIP produces patterns, shading, spirals, and mirror images. In portrait or landscape.

HP has picked up the throughput speed of this 4 ppm printer. Due to a considerably faster I/O rate, the LaserJet IIIP accepts data as quickly as your PC can transfer it. So you not

only get your output faster, you get your screen back faster. The LaserJet IIIP also has a new 16 MHz processor and PCL5 for on-the-fly typeface scaling and fast vector graphics. These advancements mean this compact printer

Call 1-800-752-0900, Ext. 2255 for your nearest authorized HP dealer.
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DIAPYCUS

A. which was added

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2. The company has a long history of providing

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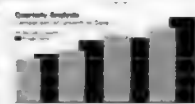
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The company has a long history of providing...
The company has a long history of providing...
The company has a long history of providing...
The company has a long history of providing...
The company has a long history of providing...

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requires less time to print than many laser printers with higher ppm rates.

For versatility, the LaserJet IIP has a multisized paper tray that accepts various sizes of paper and envelopes. An optional Adobe® PostScript® cartridge is available. And, of course, the LaserJet IIP is compatible with all major software and HP LaserJet accessories.

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**HEWLETT
PACKARD**

List Price: \$299; automatic cut-sheet feeder, \$169; manual sheet feeder, \$59; serial interface, \$49; color kit, \$59; printer stand, \$49.

Standard Warranty: Two years on parts and labor.

Dimensions (HWD): 10 x 16.8 x 12.3 inches.

Weight: 11 lbs.

Emulations: Epson FX, IBM Proprinter.

CIRCLE 603 ON READER SERVICE CARD

CITIZEN AMERICA CORP.

Citizen GSX-140

by Carol Levin

The Citizen GSX-140 not only matched the performance that earned it an Editors' Choice last year, but delivered even better results. Submitted to the daily wear and tear of word processing, graphics, and spreadsheet output, this \$499 (plus \$59 for the optional color kit) 24-pin unit made me a color convert.

Citizen America Corp., however, has not been resting on its laurels. Instead, it has recently introduced the GSX-140 Plus—essentially the same model we tested, but with faster throughput and more fonts at the same price (see our November 25, 1991 issue for a full review of this product). Citizen has also developed a driver for *Microsoft Windows 3.0* (downloadable from Citizen's bulletin board, 213-453-7564), which boosted graphics resolution for my *Windows* applications from 360-by-180 dpi to 360-by-360 dpi.

POWERFUL COLOR DRIVER

The driver provides an excellent on-screen help system that explains how to control color density and hue. It turned out images

ENDURANCE TESTS PRINTERS

Citizen has developed
a driver for *Windows*
that boosts graphics
resolution.

from *Windows*' Paintbrush and *CorelDRAW* with greater density, smoother edges, crisper colors, and superior quality to the Epson emulation.

But even under *Windows*, there were a few compromises: a substantial reduction in the size of Paintbrush images and an increase in printing time. A simple Paintbrush image took about five minutes; a complex color graphic from *CorelDRAW* left me plenty of time to run to the post office, grab lunch, and return before the job was completed. The dealer-installed 32K RAM chip (\$69) returns control of the keyboard sooner, but does not affect printing speed.

According to Citizen, you can reduce printing time by saving the image to your hard disk as a binary file and using DOS's COPY/B command. You can also set the driver to burst-print mode to increase speed for vector graphics applications, although you need several megabytes of hard disk space to do this. Also, the more-complex output was less even in color distribution and harder on my eardrums. The noise level was definitely bothersome, especially during some rather arduous color graphics jobs.

Despite the power of the *Windows* driver, wedding graphics applications and

monitors to a color dot-matrix printer still has some primitive aspects. Although the *Windows* driver's color-optimization settings let you fine-tune color, do not expect output colors to match screen colors. Peach turns into bright yellow, violet becomes rose, and light green turns into blue-green. The four-color ribbon and motor use a color-saturation technique to make 256 possible colors. For practical purposes, however, the maximum is 64 colors.

DURABLE DESIGN

The GSX-140 is durably constructed, and most of the options are easy to install. The color motor snapped in easily under the front plastic cover, and the color ribbon dropped into place with just a little nudging. You do not have to bother with switching to a black ribbon for printing in black; simply switch the ribbon settings from the front panel. The printhead is rated for 100 million characters, and the LCD panel warned me that the printhead was hot just once—after printing three color pie charts. The automatic sheet feeder (\$169), printer stand (\$49), and manual sheet feeder (\$59) worked smoothly.

Though complicated, the LCD control panel lets you set fonts, styles, and page layout; switch between automatic sheet feeder and tractor-feed paper; and conveniently clear the input buffer to stop a print job in progress. You can set all configurations through a utility disk, but I found it less intrusive to set them directly on the control panel.

Equipped with the new driver for *Windows 3.0*, the Citizen GSX-140 exceeded my expectations. Color ink-jet output may give you better quality and quieter, faster printing, but at less than half the price, the Citizen GSX-140 is a capable color printer backed up by an equally reliable technical-support staff.

Citizen GSX-140

Citizen America Corp., 2450 Broadway, #600, Santa Monica, CA 90404-3060; 213-453-0614.

List Price: \$499; color option, \$59; upgrade to 40K RAM, \$69; automatic sheet feeder, \$169; manual sheet feeder, \$59; RS-232C serial interface option, \$49; printer stand, \$49.

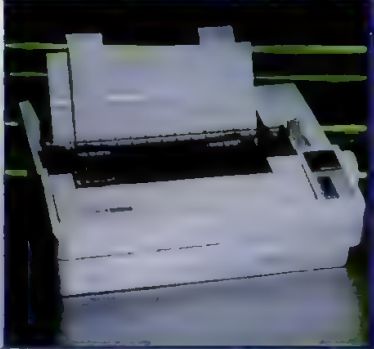
Standard Warranty: Two years on parts and labor.

Dimensions (HWD): 13.5 x 16.8 x 6.8 inches.

Weight: 12.1 lbs.

Emulations: Epson LQ, IBM Proprinter.

CIRCLE 604 ON READER SERVICE CARD



CITIZEN GSX-140

Last Reviewed: November 13, 1990, page 361.
Reason Selected: Editors' Choice.
Positive Findings: New graphics driver for *Windows 3.0* applications, easy color installation, superior technical support.
Negative Findings: Slightly noisy.

RELIABILITY 

PRINT QUALITY 

PERFORMANCE 

Printer Sharing Solutions

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- * **Easy to Install and Use**
- * **No PC RAM Memory Required**
- * **Toll-Free Technical Support**
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HWP

5 Ports

HWP-256	with 256KB	\$325
HWP-512	with 512KB	\$375
HWP-1000	with 1MB	\$425

User Upgradable Memory:
From 256KB to 16MB buffer

Input/Output Settings – 4/1 or 3/2:
All parallel ports; user configurable as either three inputs to two outputs, or four inputs to one output, buffered auto-switch

Rapid Data Transfer – 100,000 cps:
The HWP uses Direct Memory Access (DMA) for data transfers into the buffer, making the HWP hardware capable of receiving parallel data at the high rate of 100,000 characters per second.

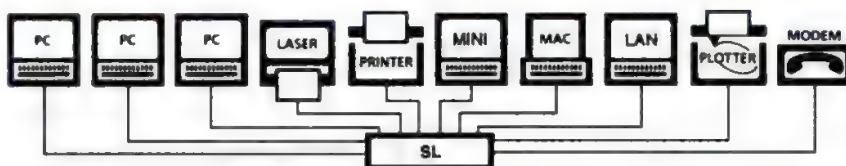
Pop-up Menu or Front Panel Buttons:
Use either the pop-up menu or the front panel switches to select printers, select the next available printer, send multiple copies, clear data, and other functions.

AS-41 5 Ports \$200

Smart Switch – No Pop-up or Buffer:
Four parallel inputs to one parallel output, electronic automatic switch with no buffer

SPPS (not shown) \$100

Interface Converter – No Buffer
Combination serial-to-parallel, or parallel-to-serial interface converter in a single unit; low-power CMOS design derives power from serial connection, no power supply needed; supports 9,600 to 115,200 bps, DIP switch configurable



Save Money by Sharing Office Resources:

The SL is the peripheral sharing solution which enables everyone to share lasers, printers, plotters, and modems. The HWP is ideally suited for sending large graphics files, but is economical enough for any kind of printing within a small workgroup.

Greater access by more users reduces unproductive idle time and the expense of purchasing additional peripherals. With a buffer, all users can simultaneously send print data and quickly release their PCs to continue working.

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SL or SLP 10 Ports

SL or SLP-256	with 256KB	\$495
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Two Configurations – Ten Ports Each:
SL – four parallel and six serial ports
SLP – eight parallel and two serial ports
Both include 15 ft. serial null-modem cable

User Upgradable Memory:
From 256KB to 4MB buffer

Any Combination of Printers or PCs:
All ten SL or SLP ports can be software configured as either input or output.

Automatically Routes and Buffers Data:
Automatic switching and queuing of jobs; automatically converts data from parallel-to-serial or serial-to-parallel

115,200 bps PC-to-PC File Transfers:
Transfer files serially between PCs up to 115,200 bps; buffer serial data to the SL several times faster than normal 9,600 bps

Pop-up Menu via Hotkeys or Mouse:
Keyboard selection of printers and many other control functions; pop-up is for convenience, but is not required

Simple Installation:
Plug in your cables; if desired, run the installation software for the pop-up menu

CIRCLE 328 ON READER SERVICE CARD

EPSON AMERICA INC.**Epson DFX-8000**

by Emerson A. Torgan

The \$3,699 heavy-duty DFX-8000 performed flawlessly in this endurance test. Epson rates the massive 63.9-pound DFX-8000 at 1,066 cps in SuperDraft mode, which equals about 275 lines per minute—a true impact workhorse.

TROUBLE-FREE PAPER HANDLING

The large (14.5 by 27.5 by 15 inches) DFX-8000 requires its own desk or printer stand in order to use both paper paths effectively, but it is not bulky. There are no protruding paper trays or sharp edges. The control buttons are easy to reach, and functions such as zero-tear-off, top-of-form, form-feed, line-feed, and micro-feed perform any paper-handling needs. There is even an optional \$149 pull tractor, helpful when printing continuous multipart forms or labels, and a \$749 automatic paper cutter that cuts up forms as they are printed.

The DFX-8000's paper-feeding system has two push tractors, front and rear, and accommodates a wide variety of paper types, including labels and multipart forms. It automatically adjusts to the thickness of the load and paper width. Paper feeds in slowly for the first few lines; the printer then shifts gears and shoots output from the top.

The sound insulation of the Epson body is very effective; it will not disturb the surrounding offices. I was able to carry on a normal phone conversation less than five feet away while yards of features tables and fact files piled up on the carpet. But though this is possible, neither we nor Epson regard the DFX-8000 as a machine

ENDURANCE TESTS**PRINTERS**

to share a desktop or personal office with; its own cubicle or small room is recommended.

EASY INSTALLATION

Most impressive, aside from size and weight, is the DFX-8000's speed and reliability. Before the DFX-8000 moved in, a typical spreadsheet print job could take an entire lunch hour. Often I would return to the ear-splitting screech of paper being mutilated by my old printer.

The DFX-8000 will finish the same print job before I can get back from the coffee maker. I commonly switch from wide-carriage paper to narrow several times a day. To see if this would cause jamming during a print job, I spent over an hour switching from front feed to rear every 30 seconds. One feed would retract and park while the other advanced. The printer never jammed. Its print quality is very consistent. Epson rates the ribbon life at 15 million characters and the print-head at 400 million characters.

The beauty of this beast is that it requires very little attention. With the exception of loading the paper paths, you accomplish everything with the touch of a button. You will never stand peering down into the works to see if you are at the top of the page. There are no handles to twist or levers to push. The only thing you need do manually is tear off the paper.

You will not buy this machine with the intention of running off the odd memo or small spreadsheet. You will not buy it for its print quality. If it's going in your office, get extension cables or you will bump into it all week. But if you're looking for a fast, heavy duty nine-pin printer that can hold its own over the long haul, you will

do well with the Epson DFX-8000.

Epson DFX-8000

Epson America Inc., 20770 Madrona Ave., Torrance, CA 90509-2842; 800-289-3776; 213-782-0770.

List Price: \$3,699; serial interface with 32K buffer, \$152; serial interface, \$64; parallel interface with 32K buffer, \$152; parallel cable, \$29; serial cable, \$29; pull tractor, \$149; paper cutter, \$749; DFX printer stand, \$250.

Standard Warranty: One year on parts and labor. Extended warranty, \$369.95.

Dimensions (HWD): 14.5 x 27.6 x 15 inches.

Weight: 63.9 lbs.

Emulations: Epson FX, IBM Proprinter.

CIRCLE 605 ON READER SERVICE CARD

EPSON AMERICA INC.**Epson LQ-850
and LQ-1050**by Glen Becker
and Susan Paige York

Epson America recently announced that the four-year-old Epson LQ-850 and LQ-1050 have been replaced by new models: the LQ-870 and LQ-1170. These newcomers carry the same price tags as their predecessors but include scalable fonts and improved paper handling. We'll examine these newcomers in this year's November printer issue.

But that still leaves four years' worth of accumulated LQ-850s and LQ-1050s in the hands of consumers and an undetermined (though probably small) number waiting to be sold. With that in mind, and since both these printers are two-time Editors' Choice winners (1987 and 1990) and also did well in our Service and Reliability survey (September 25, 1990), we decided to see for ourselves how the LQ-850 and LQ-1050 would hold up in the long haul.

THE EPSON LQ-850

We put the rugged LQ-850 through six months of varied use, including word processors, spreadsheets, and even banner programs. It gave us little trouble.

The \$749 LQ-850 has three levels of print quality: SuperDraft for quick rough drafts, normal draft for better-formed characters, and letter-quality for presentation documents. To add flexibility, the printer has three (10-, 12-, and 15-) cpi



EPSON DFX-8000

Last Reviewed: November 13, 1990, page 380.
Reason Selected: Editors' Choice.
Positive Findings: High speed, heavy volume, requires little attention.
Negative Findings: Undistinguished graphics printing.

RELIABILITY 
PRINT QUALITY 
PERFORMANCE 



850 CPS & TOUGH AS NAILS!

850 CPS. That's right – 850 characters-per-second!

TOUGH AS NAILS. Why take a chance? Thousands of owners use the 850XL printer from 2 to 18 hours per day. It just keeps on printing, day-in, day-out! And, over 50% of all 850XL printers sold are purchased by existing owners. That alone tells the



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CIRCLE 245 ON READER SERVICE CARD

ENDURANCE TESTS

PRINTERS

EPSON LQ-850

Last Reviewed: November 13, 1990, page 383.
Reason Selected: Editors' Choice.
Positive Findings: Solid performance, extremely reliable.
Negative Findings: Some banding in graphics mode.

RELIABILITY

PRINT QUALITY

PERFORMANCE

spacings, plus proportional spacing. The printer supports paper parking, allowing you to print on single-cut sheets without removing the continuous paper. Optional single-bin (\$209) and double-bin (\$209) cut-sheet feeders are available. They can handle up to 150 sheets of standard bond paper and up to 25 plain or bond envelopes.

An adjustable thickness lever lets you securely print on labels, envelopes, and multipart forms that have up to four parts. But we found that when printing labels, you can use only labels mounted on a sheet with sprocket holes, for use with the optional pull tractor (\$69). Also, while trying to print envelopes using the single-sheet loading feature, we encountered a few difficulties: ribbon loosening and crooked printing. Stick to the optional cut-sheet feeder for printing envelopes.

The LQ-850's control panel is easy enough for the features it supports. But for certain functions you must configure the LQ-850 using 16 cumbersome rear-mounted DIP switches. These control the

italic character table and the Epson Extended Graphics character table for international accented characters, mathematical symbols, and character graphics for printing lines, corners, and shaded areas. The DIP switches also let you select between SuperDraft and normal draft, control the page length, and activate the tear-off feature. Also, a micro-adjustment feature allows you to feed the paper forward or backward in 1/180-inch increments to finely adjust the loading and short tear-off features.

With the help of the documentation, getting started with the LQ-850 is a cinch. Maintaining the printer is virtually painless: Just clean the unit with a damp cloth and snap in a new ribbon when needed. Epson offers an optional ribbon cartridge that provides higher-quality printing than the standard fabric ribbon.

THE LQ-1050

The LQ-1050 is a wide-carriage counterpart to the LQ-850. The \$1,049 LQ-1050 shares the LQ-850's font capabilities, basic

print speed, graphics capabilities, and hardware features. Its ability to handle paper up to 14.4 inches wide makes it a welcome companion to long spreadsheet print jobs. It will, however, require a certain amount of space and preparation in order to work unattended.

We found that unless the unit had a printer stand and had its output positioned to fall in front of the printer, the paper had a tendency (as with many dot matrix machines) to wrap around and feed itself back into the print mechanism. Furthermore, during our stint with the machine, one of the paper bail rollers became incorrectly positioned, causing many paper jam problems. How to reposition the paper bail rollers was mentioned only in the documentation's section on the optional pull tractor—a confusing location at best. With Epson's lack of commitment to free direct technical support, frequent problems like these should be covered in more detail. But if you attend to these prerequisites, or acquire the optional pull tractor, your LQ-1050 can perform on its own for long periods.

And unattended operation is desirable with the LQ-1050. It's designed for nonsense wide-carriage printing (draft-quality reports, lengthy spreadsheets, extended multipart forms, and so on). With as much paper flowing under the printhead as this high-duty cycle printer could handle, we found the LQ-1050's noise level too high for comfort at close range. But given a secluded portion of your office and enough space to do its job, the LQ-1050 is one old-timer that can still bridge the generation gap.

Epson LQ-850

Epson LQ-1050

Epson America Inc., 2780 Lomita Blvd., Torrance, CA 90505; 800-922-8911.

List Price: LQ-850, \$749; LQ-1050, \$1,049. Serial interface board, \$64; serial or parallel interface board with 32K buffer, \$152; multifont module, \$99; pull tractor, \$69 (LQ-850), \$84 (LQ-1050); single-bin cut-sheet feeder, \$209 (LQ-850), \$269 (LQ-1050); double-bin cut-sheet feeder, \$209 (LQ-850), \$399 (LQ-1050); parallel or serial cable, \$29.

Standard Warranty: Two years on parts and labor.

Dimensions (HWD): 5.6 x 16.8 x 16 in. (LQ-850); 5.6 x 24.7 x 16 in. (LQ-1050).

Weight: 19.8 lbs. (LQ-850); 26.4 lbs. (LQ-1050).

Emulations: Epson LQ.

CIRCLE 606 ON READER SERVICE CARD

EPSON LQ-1050

Last Reviewed: November 13, 1990, page 383.
Reason Selected: Editors' Choice.
Positive Findings: Wide-carriage compatibility with many kinds of paper, attractive output, smooth paper parking.
Negative Findings: Somewhat noisy.

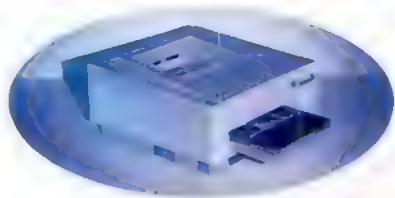
RELIABILITY

PRINT QUALITY

PERFORMANCE

All things being equal, they're not.

They're just about the same price. They're made by two very good



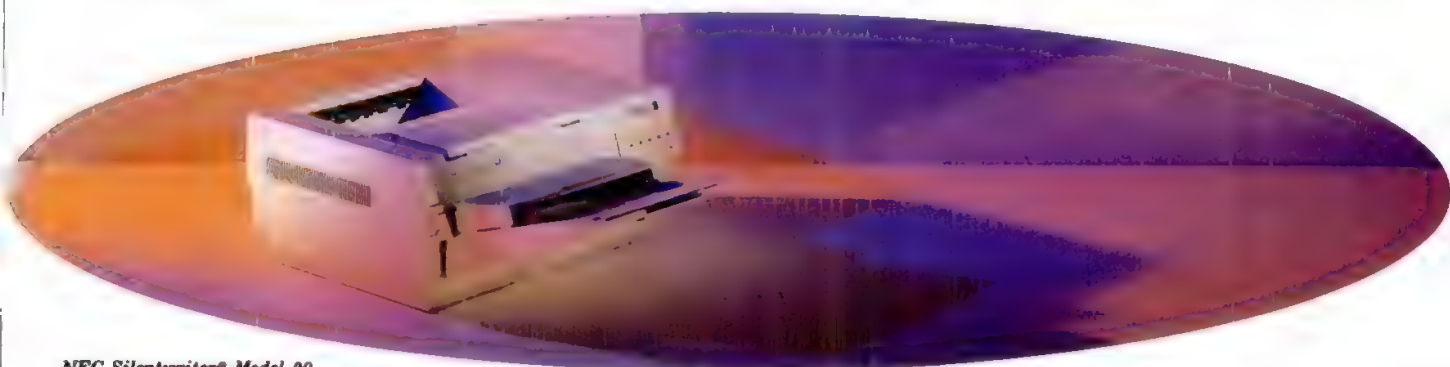
*Hewlett-Packard LaserJet III. \$2,395***

companies. Yet, there is one thing that makes

NEC's Silentwriter®2 Model 90 look much better on

paper than Hewlett-Packard's LaserJet® III. It comes

with Adobe® PostScript®. So whether you're printing newsletters or flyers,



*NEC Silentwriter2 Model 90
with PostScript. \$2,495***

sales sheets, stationery or shareholders reports, you'll have thirty-five differ-

ent typefaces to help you create the most dazzling documents possible. Of

course, you can get a Hewlett-Packard with PostScript, too. If you're willing to

pay an extra thousand dollars.* Which you'd be crazy to do when you consider

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For product literature, call 1-800-NEC-INFO. NEC's Silentwriter2

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Model 90. Take a close look and you'll find it has no equal.

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November 13, 1990
SilentWriter2 Model 90

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Jeff Prosis, nationally recognized DOS expert and author of *PC Magazine's* "Tutor" column, writes about DOS 5 in a way no one else can. He has spent countless hours to perfect and share essential techniques and utilities for all serious DOS 5 users.

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Foreword
BILL MACHRONE

Jeff Prosis answers the questions the manual leaves unanswered. He also picks up where DOS 5 leaves off with 50 all-new DOS 5 utilities. You'll find productivity-boosting programs that will dial your phone, search an entire disk for files, expand printer capabilities, compile batch

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HEWLETT-PACKARD CO.

HP DeskJet 500

by Ann Sherman

Hewlett-Packard Co.'s \$729 HP DeskJet 500 is a snap to set up and virtually trouble-free to run and maintain. While its speed lags behind that of a low-end laser printer, its crisp, well-formed output and nearly noiseless operation put 24-pin dot matrix printers to shame. But even with a street price of under \$500, this light ink-jet wonder is still only a few hundred dollars away from a personal laser—keep this in mind when you choose a printer.

EASY SETUP

Aside from opening the box and placing the 14.3-pound unit on your desk, you need only attach the cable, snap in the ink cartridge, push the plug into the nearest outlet, slide some paper into the in-tray, and you're ready to roll. (Stick to a parallel hookup; with a serial interface, the cable must be one designed specifically for Hewlett-Packard printers and you will have to struggle with two banks of DIP switches on the machine's base.)

Over my eight-month stint with the DeskJet 500, I used the printer with several word processors and spreadsheet programs. I had no trouble printing documents and worksheets—including graphs—on copier paper and 24-lb. bond. Print jobs as long as 35 pages met with consistent print quality and had no paper-devouring jams. I had to feed envelopes by hand, but they ran through their paces with equal success.

LASER QUALITY PRINTING

The DeskJet comes with three resident typefaces. The Courier fonts are available

ENDURANCE TESTS PRINTERS

in 10, 16.67, and 20 characters per inch. You can spin out each pitch in portrait and landscape modes. Although slower than its portrait counterpart, the 20-cpi landscape font proved a boon for wide *Lotus 1-2-3* spreadsheets, especially if you do not want to mess around with any add-in packages.

The proportionally spaced CG Times—especially attractive—and monospaced Letter Gothic are accessible only through software commands. At first, this bothered me. But I was able to select those fonts from several word processors, including *Microsoft Word*, *Word for Windows*, *WordPerfect*, and *XyWrite*. And in the long run, I found it too onerous to keep reaching over and cycling through the courier fonts; I selected these from software as well.

A NEW INK

Past incarnations of the DeskJet family of printers were criticized for ink that all too often smudged and ran when wet. Hewlett-Packard has replaced that ink with a new waterproof variety. And even when fresh, a printed page left no tattoos on my hands. Shoved right up under your nose, you can see minute veins of ink leaching from characters printed on photocopier paper. But despite this insignificant bleeding—which disappeared altogether with heavier paper—the shapes of the characters were indistinguishable from the type produced by a high-quality laser printer.

If you're thinking of buying the DeskJet 500, I have one caution. For a fee, Hewlett-Packard offers Epson FX-80 and IBM Proprinter III emulation cartridges. Each, however, has its own particular downfall.

The Epson emulation provides a vaguely serifed proportional font that looks like a skimpy mutation of the resident CG Times. The IBM mode sports a Letter Gothic PS, but its pitch seems more fixed than proportional. Neither emulation can address the Courier landscape modes through software, and they cannot match the 300-dpi graphics of the DeskJet mode. At the very least, they take up a slot that could otherwise be used for one of several font cartridges. Ultimately, the DeskJet drivers are available with over 600 software packages, and it seems a waste to spend \$79 for an emulation that limits rather than enhances.

Aside from the emulation cartridges, my complaints are minimal. I wish Hewlett-Packard could change the printing mechanism so that all the sheets would exit facedown—as they do with the company's LaserJet Series II and on. Reordering a long document (or a short one, for that matter) is not my favorite task. Despite my nitpicking, I have come to view the DeskJet as a dependable, reliable pal. If I couldn't afford a personal laser, I'd buy it in a minute.

HP DeskJet 500

Hewlett-Packard Co., 19310 Pruneridge Ave., Cupertino, CA 95014; 800-752-0900.

List Price: \$729; 128K memory cartridge, \$95; 256K memory cartridge, \$175; Epson FX-80 emulation cartridge, \$79; IBM Proprinter emulation cartridge, \$79; plug-in font cartridges, \$79 to \$140; downloadable soft fonts, \$79; replacement ink cartridges, \$19.95; high-capacity black ink cartridges, \$31.95.

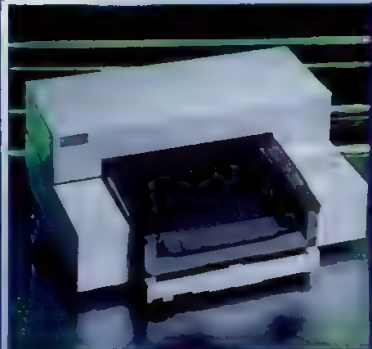
Standard Warranty: Three years on parts and labor.

Dimensions (HWD): 8.0 x 17.3 x 14.8 inches.

Weight: 14.3 lbs.

Emulations: HP LaserJet Plus.

CIRCLE 607 ON READER SERVICE CARD



HP DESKJET 500

Last Reviewed: November 13, 1990, page 290.

Reason Selected: Editors' Choice.

Positive Findings: Near-laser quality output, noiseless and dependable operation, easy upkeep, thorough and well-organized manual.

Negative Findings: Obsolete emulation cartridges; pages ejected in reverse order.

RELIABILITY ↑

PRINT QUALITY ↑

PERFORMANCE ↑

HEWLETT-PACKARD CO.

HP LaserJet III and LaserJet IIID

by Mary Kathleen Flynn
and Oliver Rist

We tried to find something wrong with Hewlett-Packard Co.'s two LaserJet brothers; we really did. But these machines proved why HP printers became a stan-

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CIRCLE 134 ON READER SERVICE CARD

To Illustrate The Northgate



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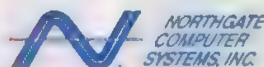
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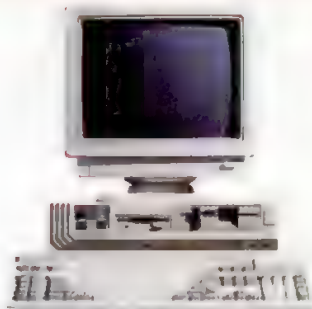
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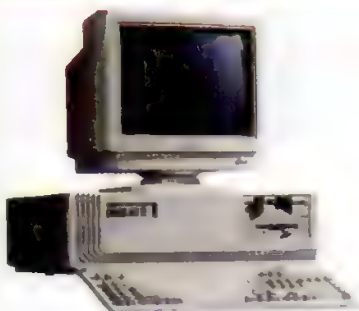
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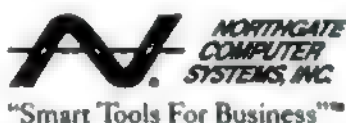
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☐ Decision-maker ☐ Decision-influencer ☐ None
3. What computer products have you been considering?
☐ 386SX-based systems ☐ 386-based systems
☐ 486-based systems ☐ Notebooks
☐ Dedicated network servers
4. How many computer systems do you already have at your company? _____
5. When will you most likely make your next computer purchase decision?
☐ Less than 3 months ☐ 3-6 months
☐ Within 12 months ☐ Don't know
6. What applications will you be running? ☐ Word processing
☐ Desktop publishing ☐ Accounting ☐ Database
☐ Spreadsheet ☐ Networking ☐ Other _____
7. Are you thinking about leasing systems? ☐ Yes ☐ No
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3. What computer products have you been considering?
☐ 386SX-based systems ☐ 386-based systems
☐ 486-based systems ☐ Notebooks
☐ Dedicated network servers
4. How many computer systems do you already have at your company? _____
5. When will you most likely make your next computer purchase decision?
☐ Less than 3 months ☐ 3-6 months
☐ Within 12 months ☐ Don't know
6. What applications will you be running? ☐ Word processing
☐ Desktop publishing ☐ Accounting ☐ Database
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dard. The \$2,395 LaserJet III and \$3,595 LaserJet IIID calmly handled everything we threw at them.

INSTALLATION

Without reading HP's excellently illustrated "Your Guide to Setting Up Your LaserJet III [IIID] Printer," installing the EP-S one-piece toner cartridge might have been a little confusing, but with it, the whole thing was over in about 15 minutes. After that, we merely snapped in the paper trays, attached the interface and power cables, and started printing. The installation manual also provided instructions for attaching the printer as a serial or parallel device. These instructions were so good, we had the IIID running as a serial device (normally a slightly involved process for a printer) in under ten minutes. We ran a few *Windows Write* and *XyWrite* documents through it that way, but soon switched it back to the parallel interface—mainly because the system needed every one of its COM ports (besides, parallel is faster).

Cleaning and maintaining the printers proved just as simple and inexpensive. You can buy a printer-cleaning kit or even a special vacuum cleaner, but in eight months of use, all we ever needed was a damp cloth and an alcohol-saturated Q-Tip (there's even a special cleaning brush for the primary corona wire tucked away inside the printer, right under the cover).

LIVING WITH A LASERJET

Using the LaserJet siblings was a joy. During our tenure with them, we encountered only one paper jam. The problem occurred when we tried to feed business envelopes manually, but did not extend the rear output tray (as is recommended in the manual) and instead let the envelopes

feed through the regular U-path to the primary output tray. The printer worked for 11 envelopes before one slipped in transit and clogged up the path.

On that note, we installed the IIID's envelope-feeder attachment (\$350). It also came with an excellent manual that let us set everything up in about ten minutes. We only used it for a little while, but ran every kind of envelope we could find through it in copious numbers and never once encountered a paper jam or incompatibility.

Both machines support HP's proprietary Resolution Enhancement technology. Over the near-year we used the III and IIID, we found this feature to most resemble the bass and treble controls on your stereo—once you set them you don't touch them again. Sure, we played with it for a little while, but after seeing the rich dark print the LaserJets produced at Resolution Enhancement's maximum settings, we set them near those positions and usually left them alone, unless we ran into some strange paper types.

ENDURANCE TESTS PRINTERS



HP LASERJET III

Last Reviewed: November 13, 1990, page 184.
Reason Selected: Editors' Choice.
Positive Findings: Rock-solid dependability and compatibility, great documentation, easy upkeep.
Negative Findings: No auto-emulation sensing; front panel that could be a little easier to use.

RELIABILITY 

PRINT QUALITY 

PERFORMANCE 

A COMPATIBILITY STANDARD

As far as compatibility goes, what can we say? It's an HP. Everything worked. From drawings derived from *Micrografx Designer*, *Windows Paintbrush*, and *CorelDRAW* to lone text and text-and-graphics combinations created in *PageMaker*, *Word for Windows*, *WordPerfect*, and *XyWrite*, everything dumped into these machines appeared on paper.

We also installed two of HP's LaserJet add-on cartridges, the HP LaserJet Distinctive Documents I and Compelling Documents I, and the Brilliant Presentations and Compelling Publications II scalable typeface collections. The instructions that came with these products were not quite as straightforward as those for the printer itself, but once everything was up and running, we encountered no further difficulties and acquired rich and versatile printouts. Running *Adobe Type Manager* and a few sample font collections from *Adobe Type Library* also yielded no problems and great typefaces.

It was while using cartridges that we encountered the LaserJets' only real design flaw. Using HP's plug-in PostScript cartridge is easy enough, but switching from PostScript to PCL and back is a needlessly arduous process. To make either switch, you must power the printer down, remove or insert the cartridge, and restart. At our fastest, this still took at least two full minutes, while other personal lasers, such as the QMS PS-410 or the NEC Silentwriter2 90 with its new *Printer Control Panel* software, allow automatic emulation sensing. A machine of the LaserJets' caliber and price should definitely wise up.

The LaserJet IIID's duplexing and dual paper trays both worked flawlessly. Du-



HP LASERJET IIID

Last Reviewed: November 13, 1990, page 184.
Reason Selected: Editors' Choice.
Positive Findings: Same as the LaserJet III plus easy duplex printing and improved paper-tray handling.
Negative Findings: No auto-emulation sensing; front panel that could be a little easier to use.

RELIABILITY 

PRINT QUALITY 

PERFORMANCE 

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ENDURANCE TESTS PRINTERS

plexing is achieved by simply selecting it on the printer's menu, while the paper trays trade off duties automatically and without ever having a conflict. Contrary to popular belief, the IIID is not too big to be a desktop machine. It's quiet enough and does not even add to the heat in your office.

These two printers have proven themselves, not only as winners right out of the box, but also as machines able to maintain that distinction over the long haul. As far as we're concerned, at street prices of \$1,500 for the LaserJet III and \$2,300 for the IIID, they are worth every cent.

HP LaserJet III

HP LaserJet IIID

Hewlett-Packard Co., 19310 Pruneridge Ave., Cupertino, CA 95014; 800-752-0900.

List Price: \$2,395 (LaserJet III); \$3,595 (LaserJet IIID); upgrade to 2MB RAM, \$230; upgrade to 3MB RAM, \$390; upgrade to 4MB RAM, \$620; upgrade to 5MB RAM, \$780; PostScript option, \$695; font cartridges, \$99 to \$349; downloadable fonts, \$99 to \$249; AppleTalk interface kit, \$275; optional envelope tray (for the III and IIID), \$89; envelope feeder (for the IIID), \$350.

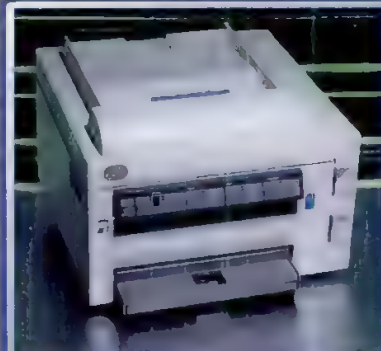
Standard Warranty: One year on parts and labor (LaserJet III); one year on-site parts and labor (LaserJet IIID).

Dimensions (HWD): 10.0 x 18.0 x 25.5 in. (LaserJet III); 13.75 x 18.25 x 32.5 in. (LaserJet IIID).

Weight: 50 lbs. (LaserJet III); 75.9 lbs. (LaserJet IIID).

Emulations: HP PCL 5.

CIRCLE 608 ON READER SERVICE CARD



IBM LASERPRINTER E

Last Reviewed: November 13, 1990, page 190.

Reason Selected: Editors' Choice.

Positive Findings: Bargain price, substantial upgradability, low-cost Adobe PostScript, excellent paper-handling features, explicit documentation, high-yield toner cartridge.

Negative Findings: Cryptic error-display codes, dual paper trays that don't trade off automatically.

RELIABILITY

PRINT QUALITY

PERFORMANCE

was easily accommodated by the corner of my desk. The LaserPrinter E, with its ease of operation and its wealth of upgrade options, targets small business users with their minds on the future.

ELEGANT DESIGN

One of the LaserPrinter E's most elegant features is that all of the operator controls, including power and the two font card slots, are accessible from the front. The standard 200-page paper drawer slides under the printer, with no additional space requirements. The documentation, in the usual IBM tradition, is extremely comprehensive. You can upgrade your LaserPrinter E to true Adobe PostScript with the \$499 PostScript option, which includes 17 typefaces. Also available is the Premium PostScript option, which includes the above, plus an outline-font cartridge that provides 22 additional typefaces. When speed becomes an issue, you can upgrade to 10 ppm with the \$1,099 upgrade option—a feature that turns this printer into a small-size wonder.

The original IBM engine provides superb paper-handling facilities. I could count on both hands the number of paper jams I experienced over the past six months. The reliability of the paper path held up even when I installed the \$329 envelope feeder unit. IBM boasts that its high-yield print cartridge lasts 50 percent longer than Hewlett-Packard's—a boast this endurance test verified. The print quality remained excellent throughout the life of the cartridge. The LaserPrinter E functioned well with *Microsoft Windows 3.0*, creating beautiful output for applications such as *Aldus PageMaker*, *Microsoft Excel*, and especially *Word for Windows*.

MINOR COMPLAINTS

Among my disappointments with the LaserPrinter E was the LED error display; its single digit size seems inappropriate on such a well-designed laser. I was further surprised and very disappointed to find that when printing with both the standard and the optional 500-page paper drawers installed, the printer does not automatically switch paper sources when one drawer runs out. This is very frustrating, since you cannot even switch paper sources manually once the "Out of Paper" error occurs.

My only hardware incident seems minor, but was a show-stopper. IBM has always loved bizarre mechanical connections to their power switches; the LaserPrinter E is no exception. A long rod, loosely inserted in the power switch, extends to the power supply in the rear of the unit. Naturally, this rod found its way out, but the easily removable side panels made rectifying the situation simple.

Intercon Associates and Accord Corp. have recently introduced font cards for the LaserPrinter series. Accord's offerings cater to the insurance business, providing special fonts for insurance forms. Intercon offers font cards that provide many additional typefaces, as well as specialized logos, signatures, and other built-in graphics. The PostScript options have also been improved to allow for automatic emulation/mode switching, adding flexibility in shared environments. Lexmark International, the manufacturer but not marketer of IBM laser printers, is expected to announce new additions to their printer line this fall. If they maintain the superior quality found in the LaserPrinter E, those new units will certainly be worth investigating.

IBM CORP.

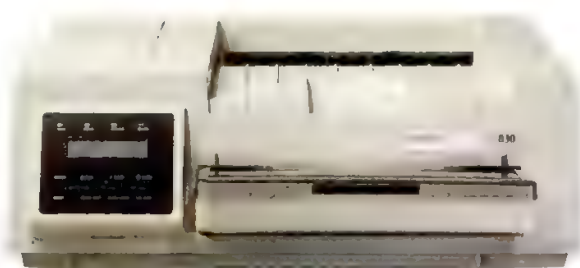
IBM LaserPrinter E

by Stephen W. Plain

After reviewing the LaserPrinter E for last year's special printer issue, I leaped at the chance to do the endurance test. I consider this printer with a list price of \$1,495 to be one of today's best buys for people looking for a high-quality entry-level laser with substantial upgradability.

The LaserPrinter E is the 5-ppm version of IBM's earlier released 10-ppm laser entry. It handles HPGL, HP LaserJet Series II, IBM Graphics Language, IBM PPDS, and true Adobe PostScript (with one of IBM's PostScript upgrade options). Measuring 10.5 by 14.3 by 27 inches, it

The new OL830 had to be smarter than the LaserJet® III to earn the Okidata OK!™



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- Gives you the best font scaling and graphic output from over 5000 different software applications.
- Offers 17 scalable plus 26 bitmapped fonts, standard.
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- Optional second paper tray for second sheets, alternate letterhead.
- 5-year printhead warranty. (Plus 1 year parts/labor on entire printer.)



Not So Smart.

- **Not-so-smart price: \$2395^{00*}**
- Only supports font scaling and graphics from a few hundred software applications without expensive brain surgery.
- The best it can manage without costly add-ons is 8 scalable and 14 bitmapped fonts.
- 1 meg is all you get, standard. Can't even remember one full page of graphics.
- No place to add a second tray. You're stuck with only one kind of paper at a time.
- Standard 1-year warranty. Not so smart.

If you think buying the smartest 8 page-per-minute business printer is a smart business move, we think you'll agree Okidata's new OL830 is a stroke of pure genius.

It Takes Brains To Make A Smart Printer.

Okidata's newest printer takes just about every important feature of the LaserJet III and adds an IQ boost all its own. The OL830 offers more typefaces and fonts for better-looking documents, and more standard memory for full-page graphics. An optional second paper tray fits underneath to switch between letter-head and second sheet, or plain paper and envelopes, without reloading. And the OL830's 5-year printhead warranty is the longest in the industry. All for a suggested retail price that's hundreds of dollars less than the LaserJet III.

So Smart, It Already Knows Your Software.

To give our smart printer even more smarts, we include Printer Control Panel™ autoswitching software from LaserTools®—a \$149 value. By switching automatically between *both* major printer emulations (Adobe's® PostScript® and HP® LaserJet), the OL830 will deliver superb output and

dazzling graphics with WordPerfect®, Lotus® 1-2-3®, Harvard Graphics®, or just about any software package, present or future, DOS or Windows.™ Since it's also fully Novell® network-compatible, users on a LAN can send output from different applications at any time without printer headaches.

Our Smartest Feature: The Okidata OK!

Most important, the OL830 comes with the Okidata OK!—our personal pledge that your new Okidata printer will provide not just adequate performance, but exceptional performance—not merely good value, but outstanding value.

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*Manufacturer's suggested retail price. Dealer prices may vary. HP and LaserJet are Reg. T.M.'s of Hewlett-Packard Inc. Adobe and PostScript are Reg. T.M.'s of Adobe Systems Inc. Printer Control Panel is a T.M. and LaserTools is a Reg. T.M. of LaserTools Corp. WordPerfect is a Reg. T.M. of WordPerfect Corp. Lotus and 1-2-3 are Reg. T.M.'s of Lotus Development Corp. Harvard Graphics is a Reg. T.M. of Software Publishing Corp. Windows is a T.M. of Microsoft Corp. Okidata is a Reg. T.M. and Okidata OK! is a T.M. of OKI Electric Industry Co., LTD. "We don't just design it to work. We design it to work wonders." is a T.M. of OKI America Inc.



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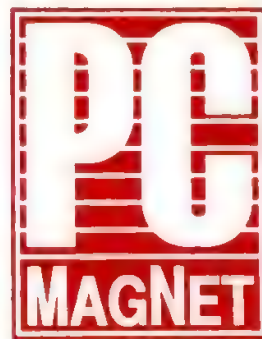
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IBM LaserPrinter E

IBM Corp., 1133 Westchester Ave.,

White Plains, NY 10604; 800-426-9292.

List Price: \$1,495; PostScript option, \$549; Premium PostScript option, \$899; Model E upgrade option, \$1,099; 500-sheet second input drawer, \$449; 500-sheet letter-size paper tray, \$129; 500-sheet legal-size paper tray, \$139; 75-envelope feeder, \$329; 1MB memory upgrade, \$299; 2MB memory upgrade, \$599; 3.5MB memory upgrade, \$999; serial printer-sharing option for 6 PCs, \$489; font cards, \$142 to \$245.

Standard Warranty: One year on parts and labor with carry-in repair service; optional on-site repair and extended warranty.

Dimensions (HWD): 10.5 x 14.2 x 20.5 inches.

Weight: 33.6 lbs.

Emulations: HPGL, HP LaserJet Series II, IBM Graphics Language, IBM PPDS.

CIRCLE 509 ON READER SERVICE CARD

NEC TECHNOLOGIES INC.

NEC Pinwriter P6200

by Gayle C. Ehrenman

Printers are a lot like horses; some are small, sleek, and good at short distances, while others, such as the \$749 NEC Pinwriter P6200, are built for the long haul.

A PECK OF PAPERS

Paper handling is where the P6200 pulls ahead of the pack. The printer easily handled every type of paper I threw at it via its single-sheet feeder and rear push tractor, including 4- by 3.5-inch memo-sized paper and standard-size business envelopes. The optional pull tractor worked without a hitch on four-part forms with carbon, heavy card stock, and labels.

Standard paper-handling features include a tear bar on the top of the front cover that lets you tear continuous sheets or forms at the perforation. The "Load/Tear Off" setting also has Short Adjust and Zero Margin emulation features that allow you to physically modify the first print line position so your printed output will match your word processing screen.

The printer also accommodates an optional single-bin sheet feeder (\$209). Unfortunately, installing this feeder is much more complicated than it needs to be. Snapping the various pieces together

and attaching them to the printer was no problem, but preparing the printer for this installation was a particularly confusing procedure. The installation guide advises you to enter the menu mode to set the sheet feeder's left margin, but the settings it suggests do not exist on the P6200. The confusion, it seems, stems from the fact that this same manual is used for installing a sheet feeder on the P6300, which does accommodate these settings. Once you figure this out, or call the technical assistance folks at NEC, as I did, the rest of the installation is a breeze.

A JAM TO REMEMBER

Right after installing the sheet feeder, I experienced my one and only hardware problem in six months of using the P6200: a paper jam. This was no ordinary paper jam, however; it was a paper jam that brought the printer to a screeching halt and managed to dislodge several pins from the printhead in the process—an unusual catastrophe for which NEC had no explanation. A call to NEC (although not to regular customer technical support) quickly produced a replacement printhead, which was easy to drop into place. The company says that neither paper jams nor fragile printheads are common problems with the P6200, and my five subsequent months with the printer bore this out. It never suffered another paper jam or damage to the replacement printhead.

A GRAPHICAL GRUMP

Although its text printing is excellent, the P6200 is less solid when it comes to graphics. It's slow (0.4 gppm on the PC Magazine Labs benchmark test), and offers little distinction between the varying

shades of gray on a halftone image. The images themselves tend to show pixelation around the edges, even in black and white. An optional color kit (\$119) will let you print color images, but these don't look much better. My attempts at printing color graphics produced richly colored images that were often streaked with black. And the wait for this less-than-ideal output bordered on the eternal.

While the P6200 is less than perfect for users who need to print lots of graphics (as are most dot matrix printers), its strong text performance and superior paper-handling capabilities make it easy to recommend. If you need a flexible and durable narrow-carriage dot matrix printer, the P6200 can go the distance.

NEC Pinwriter P6200

NEC Technologies Inc., 1414 Massachusetts Ave., Boxborough, MA 01719; 800-632-4636, 508-264-8000.
List Price: \$749; font cards, \$125 each; one-bin sheet feeder, \$209; pull tractor, \$149; color kit, \$189; serial interface, \$119.

Standard Warranty: One year on parts and labor, first 90 days on-site.

Dimensions: 11 x 19 x 14.8 in.

Weight: 23 lbs.

Emulations: Epson LQ, NEC Pinwriter.

CIRCLE 610 ON READER SERVICE CARD

NEC TECHNOLOGIES INC.

NEC Pinwriter P6300

by Robin B. Bornstein

When NEC first sent us its Pinwriter P6300 last year for our special issue on printers, it was clear why this 24-pin dot matrix printer won Editors' Choice. Now, after

ENDURANCE TESTS

PRINTERS



RELIABILITY



PRINT QUALITY



PERFORMANCE



NEC PINWRITER P6200

Last Reviewed: November 13, 1990, page 407.

Reason Selected: Editors' Choice.

Positive Findings: Good text speed and quality, excellent paper-handling capabilities.

Negative Findings: Confusing documentation, slow graphics printing, mediocre graphics quality.

giving it a temporary home on my desk-top, I have discovered even more things to like about it.

LOTS OF PAPER-HANDLING OPTIONS

The \$999 P6300 is a wide-carriage version of the P6200 (see above). It hooks up to the parallel port, but NEC also sells an optional serial-interface kit for \$119. The P6300's pull tractor (adjustable from 3.5 inches to 16 inches) and single cut-sheet feed capability are fine for regular print jobs. But NEC also offers an optional \$399 two-bin cut-sheet feeder. During testing, both feeders easily handled cut sheets, envelopes, and tripart forms. The P6300 did not jam once—even when printing on envelopes.

You can also use the P6300's internal pull tractor with one of the optional sheet feeders installed. To alternate between the tractor and feeder, simply push the front-panel Load/Unload button to park or unpark the continuous-form paper, then flip a switch on the printer's top to the push-tractor or single-sheet icon. Extra bonuses common to both feeders are a switch for faceup/facedown output and a stacker for catching the facedown output. Also, an extra slot in the feeders allowed me to hand-feed single sheets.

The dual-bin sheet feeder is optimized for a specific task: printing the first page of a multipage document on letterhead, then printing subsequent pages on plain paper. If you should have this specific need, you'll find the dual-bin feeder a perfect and hassle-free solution. Unless you plan to print lots of letterhead-and-plain-page documents, though, you should choose the single-bin sheet feeder, especially since both feeders have the same capacities: 180 sheets or 20 envelopes per bin (the dual-bin sheet feeder handles

envelopes only from its front bin).

Physically, the P6300 is sturdy enough to support the weight of its paper-handling options. In fact, the printer is huge. Weighing in at 29 pounds (without paper-handling options), the P6300 can take up as much as 16 by 25 by 15 inches with certain optional feeders installed. It stays put while the printhead flies back and forth, but you will need a large, strong desktop on which to house it. The printhead is removable, an advantage if you encounter a paper jam. NEC also offers an optional color kit (\$119).

STRAIGHTFORWARD CONTROL PANEL

The control panel, located on the printer's front, is extremely straightforward and user-friendly. Membrane buttons allow you to choose one of the eight resident typefaces or a typeface from an optional slip-in font card (\$125 each) or the \$189 IBM X24E/XL24E emulation card. Another button lets you adjust the pitch (with an LCD showing you the current pitch setting). LEDs indicate the active typeface, even when the P6300 is automatically cycling through. Other intuitive control-panel features include the Tear Paper button, which pushes the paper up to the tear bar and saves you from the "lose an inch or lose a blank page" dilemma; and the Load/Unload button, which parks and unparks the push-tractor paper.

The only problem I had with the P6300 was its noise level when printing with a paper-handling option installed. I (and a few of my coworkers) often left the area when the P6300 printed a file, even after I selected the printer's quiet mode. The sound canopy that comes with the printer

helps to subdue it a bit, but I had to remove it when I installed an option. These complaints aside, the NEC Pinwriter P6300 performed competently and I'll be sorry to send it back.

NEC Pinwriter P6300

NEC Technologies Inc., 1414 Massachusetts Ave., Boxborough, MA 01719; 800-632-4636, 508-264-8000.

List Price: \$999; font cards, \$125 each; emulation card, \$189; single-bin sheet feeder, \$269; dual-bin sheet feeder, \$399; pull tractor, \$169; color kit, \$189; serial interface kit, \$119.

Standard Warranty: One year on parts and labor, first 90 days on-site.

Dimensions (HWD): 8.25 x 22.8 x 14.2 inches.

Weight: 29 lbs.

Emulations: Epson LQ, NEC Pinwriter.

CIRCLE 611 ON READER SERVICE CARD

NEC TECHNOLOGIES INC.

NEC Silentwriter2 90

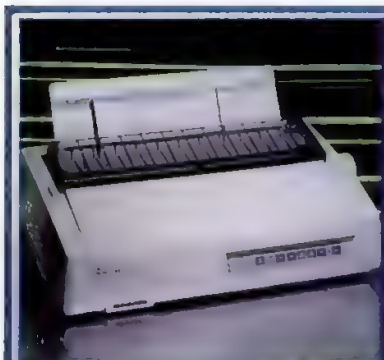
by Gary W. Kaplow

Up to now, it has been difficult, due to high prices, low quality, and complicated products, for many professionals in the graphic arts to have printers at home. For many, a trip down to the local print shop with disk in hand is the extent of printing outside the office—until now. NEC broke the low-price, high-quality PostScript printing barrier when it introduced the Silentwriter2 90 last year.

The Silentwriter2 90 carries a 6-ppm, 300-dpi print engine that produces dark print on letter- and legal-size paper, transparencies, and envelopes. The Silentwriter2 90 lists for only \$2,495—with street prices as low as \$1,700. It's only 11.6 inches high, 25.5 inches wide, and 17.3 inches deep, perfect for a home unit. Of course, the size increases when you attach the input tray and the optional output tray, but not by much.

The Silentwriter2 90 has a long list of standard features, such as a universal input tray that holds up to 250 sheets of 20-lb. paper, a facedown output tray, 35 Adobe fonts, 2MB of memory, and two built-in language interpreters: Adobe PostScript and PCL 4.

The ability to use any paper weight from 16 to 41 lbs. makes the Silentwriter2 90 very versatile. It even accepts four popular envelope sizes. All paper input is fed through the universal input tray. The



NEC PINWRITER P6300

Last Reviewed: November 13, 1990, page 407.

Reason Selected: Editors' Choice.

Positive Findings: Many paper-handling options, color capability, friendly control panel, jam-free operation.

Negative Findings: Noisy when paper-handling option is attached; undistinguished gray-scale printing.

RELIABILITY ↑

PRINT QUALITY ↑

PERFORMANCE ↑

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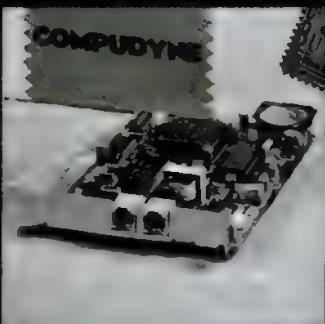


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ENDURANCE TESTS PRINTERS

NEC SILENTWRITER2 90

Last Reviewed: November 13, 1990, page 205.
Reason Selected: Editors' Choice.
Positive Findings: Small form factor, rich blacks, easy replacement of consumables, great documentation, intuitive control panel.
Negative Findings: Auto-emulation sensing not a built-in feature.

RELIABILITY ↑

PRINT QUALITY ↑

PERFORMANCE ↑

tray has a built-in feeder/guide and a manual feeder. The manufacturer offers an optional faceup output tray. NEC recommends that the faceup tray be used for any paper over 24 pounds. Because of the Silentwriter2 90's small size, the paper trail has a very tight bend in the back—a potential jamming point. The tray avoids this complete turnaround. The tray also sports a manual toggle for choosing between faceup and facedown.

MEMORY AND MAINTENANCE

Installation was easy. The step-by-step illustrated setup guide was very well written. Diagrams of lifting the printer out of the box, preparing the EP toner cartridge, and setting up the control panel made setup easier than installing *Windows*. In a matter of minutes, I had the printer out of the box, the universal input tray snapped in place, and the EP toner cartridge ready. In a quarter of an hour I was outputting PostScript documents from *PageMaker*.

As *PC Magazine*'s associate graphics director, I work with many difficult graphics, such as scans and complicated vector illustrations, so I opted to get the 2MB upgrade for the printer, making a total of 4MB of memory. This installation was also surprisingly simple: Pull out the main board, snap on the memory addition, close up the printer, and that is that. Even the most complicated graphic I created (one-and-a-half hours of printer processing time) outputted without an error.

Consumables replacement is also routine. Almost everything you need to change resides in the one-piece EP cartridge. For text-only printing, the EP cartridge will last for close to 8,000 pages. At that point, a "Low on Toner" message appears, and you change the cartridge—

pull it straight out and slide the new one in. Again, the manual illustrates every step, from opening the printer to shaking the toner cartridge before inserting it.

One of the newest and most exciting features that NEC has added to the Silentwriter2 90—and the rest of NEC's laser printer line—is a software patch, called the *Printer Control Panel*. This 5K TSR program adds auto-sensing between PostScript and PCL files, as well as a print-screen function for PostScript printers and a paste-up function that allows up to four pages to be viewed on a single sheet of paper. If you have already purchased any of the Silentwriter2 series, you may purchase the software, at a suggested retail price of \$149.95.

With the Silentwriter2 90, NEC has acquired a strong position in the industry. If you're looking for an inexpensive, reliable, and versatile personal printer, take a good long look at the Silentwriter2 90.

NEC Silentwriter2 90

NEC Technologies Inc., 1414 Massachusetts Ave., Boxborough, MA

01719; 800-632-4636, 508-264-8000.

List Price: \$2,495; upgrade to 4MB, \$995; downloadable fonts, \$200, optional faceup tray, \$139.

Standard Warranty: One year on parts and labor, 90 days on-site.

Dimensions (HWD): 11.6 x 25.5 x 17.3 inches.

Weight: 49 lbs.

Emulations: PostScript, HP LaserJet Series II.

CIRCLE 612 ON READER SERVICE CARD

QMS INC.

QMS PS-2210

by Tom Unger

This year, QMS is coming out with a huge shared laser printer called the PS-2000. It has a 70,000-sheet-per-month rated duty cycle and includes features such as *both* automatic emulation sensing and simultaneous interface operation. Last year, one of the closest things we found to a shared laser printer was the PS-2000's older though smaller brother, the \$9,995 QMS PS-2210.

MEA CULPA

When setting up the PS-2210, we eschewed the documentation and tried to get the machine up and running on our own—instantly proving the mettle of this somewhat-difficult-to-assemble printer. Because we failed to remove the tape cover from the toner cartridge (as directed in the manual), the inside of the machine was soon black with toner. Nothing but PC Labs' vacuum cleaner would remove the gobs of black powder that seemed to cover everything, inside the printer and for yards around. Nevertheless, the PS-

QMS PS-2210

Last Reviewed: November 13, 1990, page 256.
Reason Selected: Editors' Choice.
Positive Findings: Fast, clean, clear output; high reliability; 11- by 17-inch paper capacity; high duty cycle.
Negative Findings: Low paper-tray capacity (only 250 sheets).

RELIABILITY ↑

PRINT QUALITY ↑

PERFORMANCE ↑

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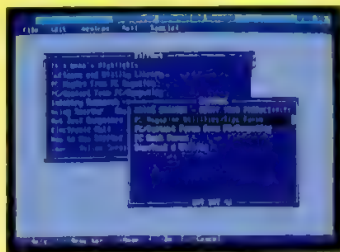
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4. List of Winners - The list of winners will be published in the November 1991 issue of PC Magazine. The list of winners will be published in the November 1991 issue of PC Magazine.

Our QMS PS-2210 ran
a bit faster than its
November 13, 1990
rating of 17.3 pages
per minute.

2210 did not streak, clot, or otherwise spit out blotched copies. In fact, for the next six months it worked flawlessly, producing clean, clear pages in all three of its built-in emulations—HPGL, HP PCL 4, and PostScript.

During those four months, we had an opportunity to put this beast through its paces—including full use of its 39 internal fonts and its graphics capability, both enhanced by 4MB of on-board RAM. If the PS-2210's internal font capacity is not great enough (in high-demand network printing installations, such as *PC Magazine's* art department, where one of these printers has been on-line for over a year), the machine has a SCSI port for a hard disk on which you can store additional fonts. In addition to the SCSI port, the printer has parallel and serial ports, as well as another port that does double duty as either an AppleTalk or an RS-422 interface.

You choose the default port, as well as various other printer options (default paper tray, emulation, and so on) via a set of six clearly marked membrane keys. Those choices are displayed on a 2-line, 20-character LCD. Although the nested choice menus are admittedly easy to use, they are a slow method of configuring this printer. Because this printer will most likely be used in network situations, most configuration work will probably be done via software. For those who want to make the most of the PS-2210's PostScript capabilities, QMS includes a set of PostScript utilities, including an intelligent menu-driven font-loader.

We tested both the parallel and the serial ports. As expected, the parallel port enabled us to print text and graphics at significantly higher speeds. In fact, our endurance-test machine ran a bit faster than its November 13, 1990 rating of 17.3 pages per minute, achieving a speed of 17.7 pages per minute with pure text out-

ENDURANCE TESTS PRINTERS

put. We found that the PS-2210 repeated its earlier performance of one graphics page per minute for pure graphics output.

BIGGER TANK, PLEASE

The single major complaint we had with this printer when it won an Editors' Choice was its measly 250-sheet paper tray. Although the tray worked flawlessly, its paltry capacity, compared with this printer's herculean output capabilities, is akin to putting a 3-gallon gas tank on a long-haul truck. We were similarly disappointed with its otherwise versatile manual-feed tray. Although it handled all manner of paper and envelopes with no trouble, its shallowness (a maximum of about 75 pages) required frequent work stops when we printed longer documents. The QMS PS-2220, a dual-tray version of the PS-2210, offers a maximum of 500 sheets, but you'll pay an additional \$2,000 for this advantage.

QMS includes clear, easy-to-read documentation. It features a full list of PCL control codes (some of which differ slightly from those published in Hewlett-Packard's LaserJet Series II manual), and an excellent troubleshooting section. This printer comes with a 90-day parts-and-labor warranty, although QMS does offer an optional \$1,530 (first year) maintenance contract—a wise choice for those who plan to pump out this machine's maximum number of copies per month. Furthermore, an on-site maintenance contract would be considerably easier and cheaper than having to ship—to say nothing of *lift*—this printer back to the dealer for repairs.

The QMS PS-2210 is indeed a beast—but a beast with a mission. We found it to be a consistent PostScript performer for the duration of our endurance test, and worthy of the Editors' Choice it netted nearly a year ago. ■

QMS PS-2210

QMS Inc., 1 Magnum Pass, Mobile, AL 36618; 800-631-2692, 205-633-4300 ext. 1253.

List Price: \$9,995.

Standard Warranty: 90 days on parts and labor.

Dimensions (HWD): 14.2 x 43.6 x 20 inches.

Weight: 90.8 lbs.

Emulations: HPGL, HP LaserJet Plus, PostScript.

CIRCLE 613 ON READER SERVICE CARD

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by
Andrew Schulman

Lab Notes

Would you like to get into *Windows* programming without having to write 80 lines of code just to print out "Hello World"?

A C compiler and the *Microsoft Windows Software Development Kit (SDK)* may be indispensable for writing "killer apps," but most of us don't want to do anything so murderously complicated. What we need is a kind of toolkit—an "API calculator," as it were—that makes it easy to do input and output under *Windows*. And while we want access to the entire *Windows* API, we need something a little more interactive than the C/SDK combination. To display the results of a straightforward *Windows* API function like `GetVersion()`, we want to be able to enter something as simple as

```
PRINT GetVersion()
```

That sounds a lot like a BASIC interpreter! Since the late 1960s, BASIC has been the world's foremost interactive programming language. For all its flaws, in BASIC simple operations—like displaying some text on the screen—are simple.

But this is *Windows*, not DOS, of course. Running QuickBASIC in a DOS box under *Windows* won't do any good: To make *Windows* API calls, you need something running on the *Windows* side of the fence. How would BASIC operations like INPUT and PRINT handle the input/output requirements of a *Windows* application? How would you access the *Windows* API?

Fortunately, the BASIC work has been done. There are now at least five different BASIC development environments for *Windows*, plus two *Windows* "batch" languages with a BASIC-like syntax:

- Visual Basic (Microsoft; Redmond, Washington);
- *Word for Windows*, WordBASIC (Microsoft);
- *ObjectScript* (Matesys; Larkspur, California);
- *Realizer* (Within Technologies; Mount Laurel, New Jersey);

A BASIC Approach To Programming in Windows, Part I

■ *Word for Windows'* WordBASIC macro language lets you write programs for the whole *Windows* API without the baggage of a C compiler and the SDK.

- WinBASIC (Blackwell Scientific; Oxford, England);
- *Bridge Toolkit* (Softbridge; Cambridge, Massachusetts);
- *BatchWorks* (Publishing Technologies; Austin, Texas).

Far from being simple-minded "ports" of character-mode DOS versions, all these products are genuine windowed applications that make clever and imaginative use of the *Windows* interface.

This Lab Notes will focus specifically on WordBASIC, which is actually the macro language contained in Microsoft's word processor, *Word for Windows* (a.k.a. *Winword*). WordBASIC is strikingly similar to Microsoft's new Visual Basic (VB). It is also undoubtedly the most widely available of the BASICs and batch languages listed above. At least one reason for the popularity of its approach is that Microsoft provides a free "Working Model" of *Winword* that includes full WordBASIC capabilities. The sidebar "Using WordBASIC in the *Word for Windows* Working Model" discusses how to adapt this Working Model for use as a WordBASIC editor.

I'll be talking here about using *Winword*, Version 1.1 (and 1.1a), not as a word processor or "document processor" but as a BASIC interpreter that lets you access the *Windows* API. (Where WordBASIC seems inadequate I'll turn to another BASIC, such as *Realizer*.) Happily, by shielding you from the worst low-level aspects of the *Windows* API, WordBASIC lets you think a little more clearly about what's really going on behind the scenes in *Windows*. That's important from the perspective of a programmer fairly experienced in writing character-mode DOS applications but completely new to *Windows* programming.

SOLVING THE DISPLAY PROBLEM

When looking at an API like the mouse or expanded memory for the first time, a DOS programmer will invariably start by writing a short program that simply verifies the presence of the interface, using its Install Check function. For the mouse API such a program would be built around interrupt 33h function 0. If your program produces the correct report ("mouse present" when one is installed and "no mouse" when one isn't), then you can proceed to more difficult parts of the API.

It makes sense to try the same kind of approach with the *Windows* API by starting with a program that simply displays the *Windows* version number. Writing a *WinVer* program (as we might call it) may seem like a waste of time, but like the tiny mouse-presence test program, it's a "sanity check" that ensures we are calling the *Windows* API properly.

If you look through the 3-pound *Mi-*

USING WORDBASIC IN THE WORD FOR WINDOWS WORKING MODEL

by Andrew Schulman

A "Working Model" version of *Winword* is available free from Microsoft (ask for Part No. 15573). The same program is also included with the book *Learn Microsoft Word for Windows* by Michael Bloom (Microsoft Press, \$29.95). The Working Model lets you save and print documents of only two pages, but otherwise it is so similar to the full version of *Winword* that some entrepreneurial souls have taken to using the Working Model to start résumé-typing services!

For our purposes, the important point is that the Working Model supports WordBASIC. Indeed, what I want to do here is to walk you through the process of customizing the *Winword* Working Model so that you can turn it into a handy WordBASIC interpreter.

After running the *Word for Windows* Working Model SETUP program, click on the newly created Program Manager item for *Winword*. If you're using a shell other than Program Manager, simply run

```
d:\WINDOWS\WORDDEMO\Winword.EXE
```

You'll get a lot of flashing and repainting of the screen (a rather grotesque introduction to a great product), after which you'll be treated to a rather unfortunate-looking set of "buttons" in a DEMO.DOC file. Don't be put off; we'll get rid of this nonsense. For now, click on the "Explore Working Model" button.

From the Macro menu, select the Edit item. Then click on OK when you get the message box that reads, "Please do not edit macros or this Working Model may not operate properly." You're going to do just that, of course, and the Model will survive very well, thank you. When a dialog box pops up with a list of macros you can edit, select the AutoExec macro. As its name implies, this subroutine is automatically run each time you start *Winword* (unless you override it by running *Winword* with /m, followed by a macro name, on the command line).

You're now in the WordBASIC macro editor/debugger, viewing the AutoExec macro. Study it: It's really an amazingly informative document. At the top there are dynamic links to the *Win-*

dows API functions GetModuleHandle() and GetModuleFileName(). There are dialog boxes created on the fly. There are SetProfileString statements to change WIN.INI. And, at the very end, there is the statement:

```
FileOpen "demo.doc", 1
```

It's this statement that brings up the silly-looking demo file each time you run the Working Model. To can the demo, just comment out the line; use either the ' or a REM statement, just as you would in other BASICs.

Next, you want to get rid of the pesky message box that pops up when you select MacroEdit. To do this, you must edit the WordBASIC macro called MacroEdit. Even macro editing in WordBASIC is controlled by a macro.

If you simply select MacroEdit from the dialog box tied to the Edit choice on the Macro menu, however, nothing will happen. That's because you're trying to run the MacroEdit macro on itself. To break out of this recursive hall of mirrors you must write a short temporary macro. Select Edit from the

Microsoft Windows Programmer's Reference, you will eventually find the GetVersion() function. It returns a 2-byte value with *Windows*' major version number (for example, 3) in the low byte and the minor version or revision number (for example, 0) in the high byte. It's pretty clear how to call GetVersion(), but how do you get it to display its results? Ironically for such a visually oriented system as *Windows*, that's the hard part!

In the sidebar to a previous Lab Notes ("Windows and Printf()", June 25, 1991), I discussed one approach—using C—to solving the problem of displaying output. For programmers who are new to *Windows*, the most important feature of WordBASIC is that it completely solves the problem. Indeed, WordBASIC contains a whole multitude of ways to display output under *Windows*. At the same time, since it provides nearly complete access to the API, we really can use WordBA-

SIC as a tool for exploring *Windows*.

Figure 1 shows a WordBASIC version of the WinVer program. To enter this program in *Winword*, select Edit from the Macro menu. (If you haven't got a Macro menu yet, you must first select the Full Menus item in the View menu.) Select the Template rather than the Global context if you can (don't worry if you can't) and type in the name WinVer. You will then be presented with the *Winword* macro editing window. Type in the WinVer program and click the Start button.

Instantly, the string "Windows v. 3.0" will be displayed in the *Winword* status bar, as shown in Figure 2. This kind of response answers the need for what I earlier called an "API calculator": Just type in a few simple lines and see the results immediately. All we had to do here was use the DECLARE statement (which I'll discuss later) to describe the GetVersion() API function, call the function (it takes

no parameters, so no parentheses are needed in the function call), extract the high and low bytes, and use the PRINT statement to display the results.

EVENT-DRIVEN PROGRAMMING

Notice the phrase, **Sub MAIN**, in Figure 1, however. Although I previously referred to WinVer as a WordBASIC program, in reality there is no such thing. Instead, in WordBASIC (as in Microsoft's Visual Basic) what you write are *subroutines*. These subroutines are not stored individually in standalone .BAS files; instead, they are grouped together in *Winword* template (.DOT) files.

So you'll be writing subroutines, not standalone programs. *Word for Windows* calls these subroutines when you click the Start button in the macro editing window. And to make calling a subroutine easier, you can attach it to a menu item or associate it with a keystroke so that whenever

Lab Notes

Macro menu again, and type in a name like "tmp". Then, in the macro editor, enter the following:

```
REM tmp
Sub MAIN
    MacroEdit "MacroEdit"
End Sub
```

Now when you click on the Start button, up comes the text of the MacroEdit macro. And there you'll find the simple, one-line call to MsgBox that produces the annoying message. Just ' or REM it out.

At this point you should save these changes and see what effect they have had. Double-click on *Winword's* Close box. You will be asked a number of times about saving. Simply say Yes each time, except for the "tmp" macro—and it won't hurt anything if you save that as well. If you find that saving the NORMAL.DOT global document template file takes a long time, don't panic: This is, unfortunately, perfectly normal. (Later, you may want to consult a book about *Winword* in order to see how to create a template file

for your own macros.)

Now, click on the *Winword* icon. The program comes up and...no more demo file. Next, select Edit from the Macro menu and...no more warning message box.

Once again, you can select Macro Edit. But since you'll be doing this every time you start *Winword* (remember, we're customizing this version of *Winword* to act as a WordBASIC interpreter rather than as a document processor), you might as well put this menu selection right into the AutoExec macro, in the same place that you REM'd out the FileOpen "demo.doc" statement

```
MacroRun "MacroEdit"
```

There's one more change you should make. If you experiment with the Working Model, you'll notice that if you close all open documents, the DEMO.DOC file opens again! Not surprisingly, there are a couple of macros in the Working Model that open this file if nothing else is going on.

The offending macros are FileClose

and DocClose. Delete the entire contents of each one except for the lines

```
Sub MAIN
Super FileClose ' or Super
DocClose
End Sub
```

(Consult the *Winword Technical Reference* if you're curious about this "Super" stuff.) Save all your changes again by closing *Winword*, answering Yes to all questions.

When you bring up *Winword's* now-customized Working Model again, you're ready to start using it as a WordBASIC interpreter. Actually, though, you've been doing that all along. You've seen in the main article how easy it is to display a message with the MsgBox statement. If you studied the AutoExec macro, you saw how dialog boxes are created and how to make *Windows* API calls. It may seem as if you've disabled Microsoft's carefully constructed PR demo, but in fact it's hard to imagine a better demonstration of *Winword's* customizability than what you've just done. ■

you select that menu item or press that key from inside *Winword*, the subroutine will be invoked.

The Assign to Key and Assign to Menu items on the *Winword* Macro menu, or the MacroAssignToKey and MacroAssignToMenu statements in WordBASIC (shown in the WinVer2 subroutine in Figure 3), can be used to attach WordBASIC subroutines to keys and menus.

The changes to the *Winword* menus resulting from the WinVer2 subroutine are shown in Figure 4. Hitting Alt-V or selecting "Windows Version" from the Utilities menu will now run WinVer.

Winword has a related facility I find quite amazing: You can create "hypertext" sections of a document which, when clicked, will invoke any WordBASIC subroutine you choose (note that arguments cannot be easily passed to the subroutine).

The *Winword* {macrobutton} field accomplishes this feat. For example, if you've

typed in and saved WinVer, you can go to any *Winword* document, hit CTRL-F9 to insert a field (which initially is just a pair of curly braces), and then fill out the field so it looks like the following:

```
{macrobutton WinVer [Click me!]}
```

If you then press SHIFT-F9, you will see only the words [Click me!]. Click them and WinVer runs. Magic! That macros can be invoked directly from fields of a

document shows that in *Winword* it becomes rather difficult to tell the difference between a document and a program!

If you stop to consider this a moment, and then contrast it with the way a BASIC program is invoked under character-mode DOS, you may gain some insight into why *Windows* programming is often referred to as "event-driven." If you are familiar with the

```
ON event GOSUB
```

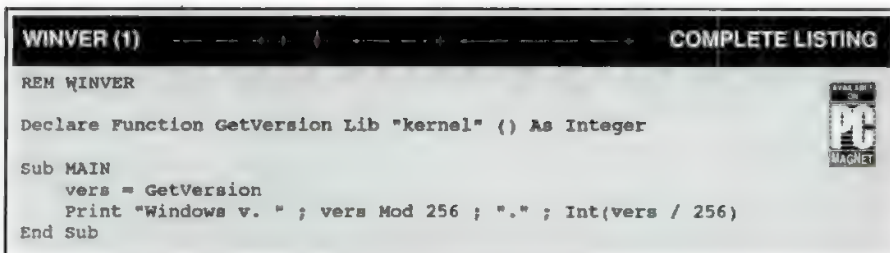


Figure 1: A simple WinVer subroutine written in WordBASIC.

Lab Notes

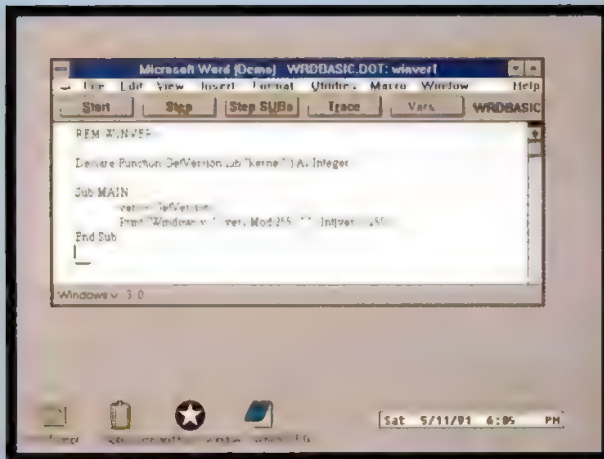


Figure 2: The output from the code in Figure 1 is printed in the Winword status bar.

statement in BASIC, event-driven *Windows* programs can be seen as little more than collections of subroutines, each of which runs "on" the occurrence of some event.

In standard *Windows* programming terminology, these events are "window messages," with such names as WM_KEYDOWN (for a key press), WM_COMMAND (for a menu selection), WM_TIMER (for a "time" event), and so on. In essence, a *Windows* program (such as WINWORD.EXE itself) is structured along the lines of the pseudo-code shown in Figure 5. This is not genuine code, of course; it's simply BASIC-looking text that presents a bird's eye view of the way *Windows* applications are structured. *Windows* programs are generally written in C, but the frequently lengthy "switch (message)" statement found in those *Windows* C programs is really equivalent to a series of the old **ON event GOSUB** statements in BASIC.

Given this fact, it is somewhat surprising that WordBASIC does not make even more use of the **ON event GOSUB** syntax. There is an OnTime statement that attaches a subroutine to a timer, and there is an OnError statement, but with these exceptions, the perhaps poorly structured but nonetheless very intuitive ON statement has been replaced by other event-driven constructs.

Thus, for example, even though Microsoft BASIC for the Macintosh has an

statement, in WordBASIC we use the MacroAssignToMenu statement instead. In QuickBASIC there is the

```
ON KEY(n) GOSUB
```

statement; similarly, *Microsoft Excel* has an

```
ON KEY(key, macro)
```

statement in its macro language. As we have seen, however, WordBASIC uses MacroAssignToKey for the equivalent functionality. Both these and the "on x do y" forms, however, fit nicely with the event-driven architecture of *Windows*. WordBASIC is an event-driven language in procedural clothes. Since it can be difficult to wrap your mind around the idea of event-driven programming, these procedural clothes can be quite attractive.

IMPROVED OUTPUT

Granted that the GetVersion() API call is not terribly exciting, WinVer has taught us that we can invoke an arbitrary *Win-*

dows API function with a few lines of an easy-to-write, easy-to-read BASIC subroutine. We can call the subroutine with a menu selection or a keystroke, or by clicking in a document, or by hitting the Start button in the macro editing window, or, if all else fails, by typing its name in the Macro Run dialog box. We can even call a macro by putting /m, followed by the macro name, on the command line used to invoke *Winword*, as, for example:

```
Winword wrdbasic.doc /mWinVer
```

We now have a foundation on which to build more interesting programs (or rather subroutines).

The **PRINT** statement in WordBASIC prints on the *Winword* status bar. (If a stream number, such as #1, is used as the first argument to PRINT, then it prints to a file.) This is acceptable for a program like WinVer, which has only one line of output, but what happens if you have several lines? Suppose, for example, that you wanted to add another statement to WinVer to display the current *Windows* "mode" (Enhanced, Standard, or Real). If we use **PRINT** again, it will obscure the results of our first **PRINT** statement.

This isn't a problem, because WordBASIC gives you several different ways to produce output. After **PRINT**, the next easiest to use is the MsgBox statement, which is merely a BASIC wrapper around the handy *Windows* MessageBox() API call. It can display multiple lines of output.

Figure 6 shows an improved version of the WinVer subroutine. In addition to the GetVersion() function, WinVer now also calls the GetWinFlags() and GetSystemMetrics() API functions. The results appear as in Figure 7, which shows WinVer popped up over a document that a user is editing in *Winword*; WinVer now displays the *Windows* mode and also indicates whether it is running under a "debug" version of *Windows*.

Although this message box is far more

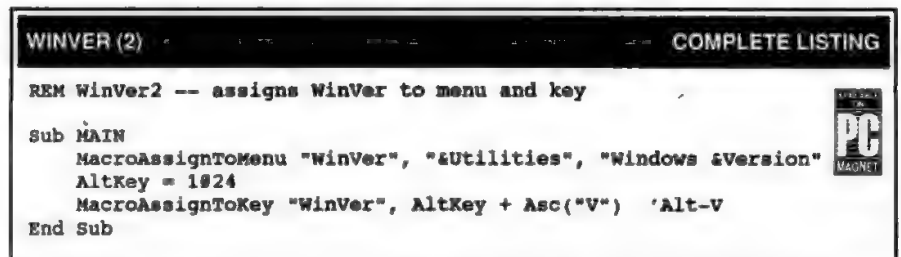


Figure 3: WordBASIC macros can be assigned to menu items or to keys.

```
ON MENU(menu_id) GOSUB
```

Lab Notes

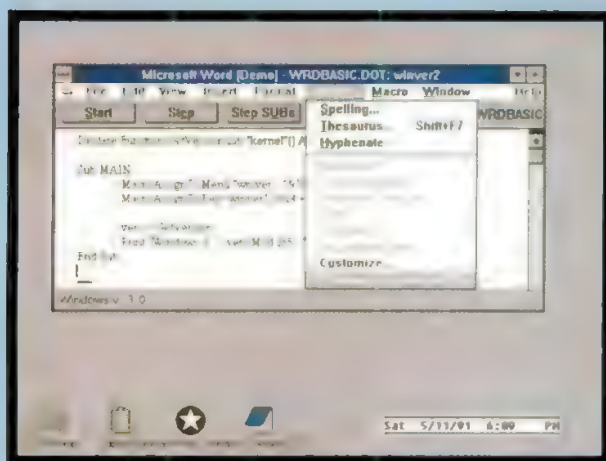


Figure 4: The item "Windows Version" has been added to the Utilities menu by the additional code in Figure 3. Pressing Alt-V gives you another way to run the WinVer subroutine.

attractive than the output of the **PRINT** statement, it still begs a few questions. Since *Winword* is a graphics-based document processor, can't we make use of those neat features that let you display italicized, demibold, underlined text in 24-point Helvetica? Why bother with **PRINT** statements and message boxes when we have a full collection of display resources just waiting to be tapped?

Besides access to every *Windows* API function, WordBASIC allows complete access to the word processing aspects of *Winword*. The **INSERT** statement in WordBASIC, which places text at the "insertion point" in the current *Winword* document, can be used to display the results of *Windows* API calls. In other words, we can use *Winword* documents as our "output device."

Figure 8 lists the final version of the WinVer code, and Figure 9 shows its result. This time, I've added the WordBASIC FileNew, Font, and Insert statements to send output to a *Winword* document. I've also used the *Windows* GetActiveWindow() and SendMessage() API calls to change the title of the WordBASIC window. Figure 8 also uses LO() and HI() functions to extract the major and minor version numbers.

After running this subroutine, however, you'll notice that it does not restore the original window title when it finishes. We really should fix that. The TITLEBAR routine listed in Figure 10 is a WordBASIC macro that demonstrates how to alter and restore title bars properly. While

TITLEBAR manipulates the title bar of *Winword* itself, using the `GetActiveWindow()` *Windows* API function to get a handle to its own window, it could have just as easily manipulated any other window whose handle it knew. (In Part 2 of this article I'll discuss other *Windows* API functions that can be used to find window handles.)

The program first calls `GetWindowText()` to save the current text of the *Winword*

title bar. It then calls `SetWindowText()` to change the title bar. The `MsgBox` statement then displays a message asking the user to glance at the title bar—just so he can see that we’ve changed it before we change it back.

Next, the program uses the Word-BASIC AppMinimize statement to reduce *Winword* to an icon and goes into a loop, changing the title bar 100 times. This demonstrates yet another way to produce output: by setting the text that is displayed when a window is iconic. This time, just for variety, we change the title bar by using the *Windows* SendMessage() API function to send the WM_SETTEXT message to our own window. This is equivalent to calling SetWindowText(), a function that is just a handy “wrapper” around SendMessage WM_SETTEXT. (We’ll examine *Windows* messages in more detail in Part 2 of this article.)

When the loop completes, **TITLEBAR** restores *Winword* to its non-iconic state and uses `SetWindowText()` once more to restore the original wording of its title bar.

RUNTIME DYNAMIC LINKING

We've seen how WordBASIC offers a multitude of solutions to the *Windows* display problem. We've also seen that writing subroutines rather than separate standalone programs reflects the event-driven nature of *Windows* programming.

```

ON_EVENT PSEUDOCODE                                     COMPLETE LISTING
INIT:
ON WM_KEYDOWN GOSUB KEY_HANDLER
ON WM_CHAR GOSUB CHAR_HANDLER
ON WM_COMMAND GOSUB MENU_HANDLER
ON WM_LBUTTONDOWN GOSUB MOUSE_HANDLER
ON WM_PAINT GOSUB REPAINT_HANDLER
ON WM_QUIT GOSUB EXIT_HANDLER
CREATE WINDOW
<now just wait for, and respond to, messages>

KEY_HANDLER:
<have raw key resent as ASCII character via WM_CHAR>

MENU_HANDLER:
<respond to menu selections here>

MOUSE_HANDLER:
<respond to mouse clicks here>

CHAR_HANDLER:
<respond to character input here>

REPAINT_HANDLER:
<repaint our window here;
this is where output is actually displayed>

EXIT_HANDLER:
<shut down the application here>

```

Figure 5: As this pseudo-code illustrates, *Windows'* event-driven programming resembles the ON event GOSUB statement in BASIC.

Lab Notes

```

WINVER (3)                                     COMPLETE LISTING

Declare Function GetVersion Lib "kernel" () As Integer
Declare Function GetWinFlags Lib "kernel" () As Long
Declare Function GetSystemMetrics Lib "user" \
    (nIndex As Integer) As Integer

Function LO(x)
    LO = x Mod 256
End Function

Function HI(x)
    HI = Int(x / 256)
End Function

Sub MAIN
    v = GetVersion
    vers$ = "Windows v. " + Str$(LO(v)) + "." + Str$(HI(v))

    debug = GetSystemMetrics(22)          ' SM_DEBUG
    If debug Then vers$ = vers$ + " (Debug)"

    flags = GetWinFlags
    If flags And 1 = 0 Then mode$ = "Real mode"
    If flags And 16 Then mode$ = "Standard (286) mode"
    If flags And 32 Then mode$ = "Enhanced (386) mode"

    MsgBox vers$ + Chr$(10) + mode$, "WINVER"
End Sub

```

Figure 6: An improved version of WinVer.

Finally, we've seen how easy it is to make *Windows* API calls after using the WordBASIC **DECLARE** statement.

But just how does the **DECLARE** statement itself work? When you type a declaration, such as `Declare Function GetVersion` or `Declare Sub SetWindowText`, does *Winword* look this up in some sort of table it maintains of all *Windows* functions?

No. *Winword* and WordBASIC know absolutely nothing about these functions. The WordBASIC **DECLARE** statement is instead an example of *Windows*' dynamic linking. While it's often said that *Windows* is built on dynamic link libraries (DLLs), normally their presence is invisible. The WordBASIC **DECLARE** statement, however, lets you see dynamic linking in action. **DECLARE** can be used to link to any function in *any* DLL—even DLLs that you create yourself and of which WordBASIC obviously has no prior knowledge.

The key to the **DECLARE** statement is the **Lib** clause (such as `Lib "kernel"` or `Lib "user"` in Figure 8). This either loads a DLL into *Windows* memory or establishes a connection with one that has already been loaded. *Windows* itself consists primarily of three DLLs: **KERNEL** (system services, such as memory management), **USER** (window management),

and **GDI** (graphics). When you want to call a *Windows* API function from WordBASIC you must first **DECLARE** it, using the **Lib** clause to tell WordBASIC the name of the DLL it lives in. (If you don't know the DLL name, just guess; when you run the macro, WordBASIC will pop up an "Illegal function call" message until you get it right. If you specify a non-existent DLL name, WordBASIC will flag the offending line as an error.)

WordBASIC takes the DLL string name (for example, "kernel" or "user") and

passes it to the *Windows* API function `LoadLibrary()`. Given the string name of a DLL, this function loads the library (or sees if it is already loaded) and returns a "handle" (an ID number) for it. This handle can then be passed, along with a string name of a function, to the *Windows* API function `GetProcAddress()`. This function returns a callable pointer to the function.

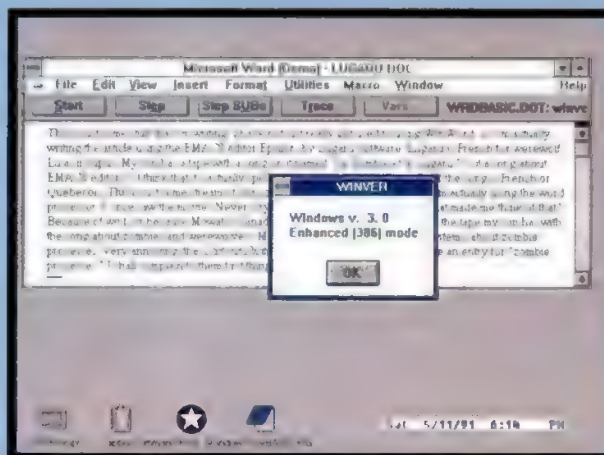
In essence, the `LoadLibrary/GetProcAddress` combination is used to turn a pair of strings, such as "kernel" and "GetVersion," into a callable pointer to `GetVersion`, just as if it had originally been linked right into our program. But unlike the action of programs such as Microsoft's **LINK** or Borland's **TLINK**, here linking is dynamic: It takes place while *Winword* is running.

You can see this in action using WordBASIC itself. **DYNLINK**, which is shown in Figure 11, uses the WordBASIC **INPUT** statement to ask for a module name and a function name. It then passes these names to `LoadLibrary()` and `GetProcAddress()` and uses the **PRINT** statement to display the resulting module number and function pointer. (Again, too, we see how WordBASIC serves as a simple API calculator.)

The WordBASIC **DECLARE** statement serves as a high-level interface to this same runtime dynamic linking. Most importantly, it lets us call functions to which we have been dynamically linked by providing a way to specify the number and type of parameters they expect and the type of return value (if any) they supply.

An example may help clarify this. The WordBASIC statement

Figure 7: The code version shown in Figure 6 makes use of a *Winword* document as an output device.



Lab Notes

```
Declare Function LoadLibrary \
  Lib "kernel" (modname as \
  String) As Integer
```

is equivalent to the C declaration

```
/* lives in KERNEL */
int LoadLibrary(char far
  *modname);
```

The difference between the two declarations, however, is that the C version is essentially compiled into the program, while the BASIC version is obviously not part of WINWORD.EXE (we just typed it in ourselves!). The BASIC declaration then clearly does not take effect until runtime, which is an example of extremely dynamic linking.

This feature is not of *Winword* nor *WordBASIC* but of *Windows* itself. Since it lets linking occur while a program is running, *Windows* offers extraordinary opportunities for writing interpreted languages,

scripting facilities, macro add-in facilities for applications, and the like. Far from spelling the end of "batch" languages, *Windows* maintains tremendous support for such languages; runtime dynamic linking is one example of such support. We will see more examples in Part 2 of this article.

ANOTHER BASIC

If you compare the declaration just shown for `LoadLibrary()` with the actual declaration in the *Microsoft Windows Programmer's Reference*, you'll be unpleasantly surprised to find that this function actually returns an unsigned handle, not a signed integer. One of the annoying features of *WordBASIC* (which seems also to have been perpetuated in *Visual Basic*) is that it does everything using *signed* arithmetic!

Actually, *WordBASIC* does everything with signed *floating-point* arithmetic. In the *WinVer* macros at the beginning of this article, you may have been puzzled by the fact that I used the expression `Int(vers / 256)` to extract the high word from the number returned by `GetVersion()`. Why not use the *BASIC* integer division operator? The use of floating-point in *WordBASIC* explains why not: While the `GetVersion()` return value is picked up as a *LONG* (as noted in the **DECLARE** statement), *WordBASIC* promptly (if stupidly) converts it into a signed floating-point number.

Usually, this conversion does no harm, but in some cases it makes *WordBASIC* unusable for calling *Windows* API functions. You might need to declare a parameter or a return value as *DWORD*, for example; but in *WordBASIC* (and *Visual Basic*) your only option is a (signed) *LONG*. In some cases, *Windows* packs two word-sized values into a *DWORD* return value. Trying to unpack these in *WordBASIC* seems nearly impossible, since operators such as `Mod` appear to accept only signed integers in the $\pm 32K$ range. Furthermore, many *Windows* API functions expect point-

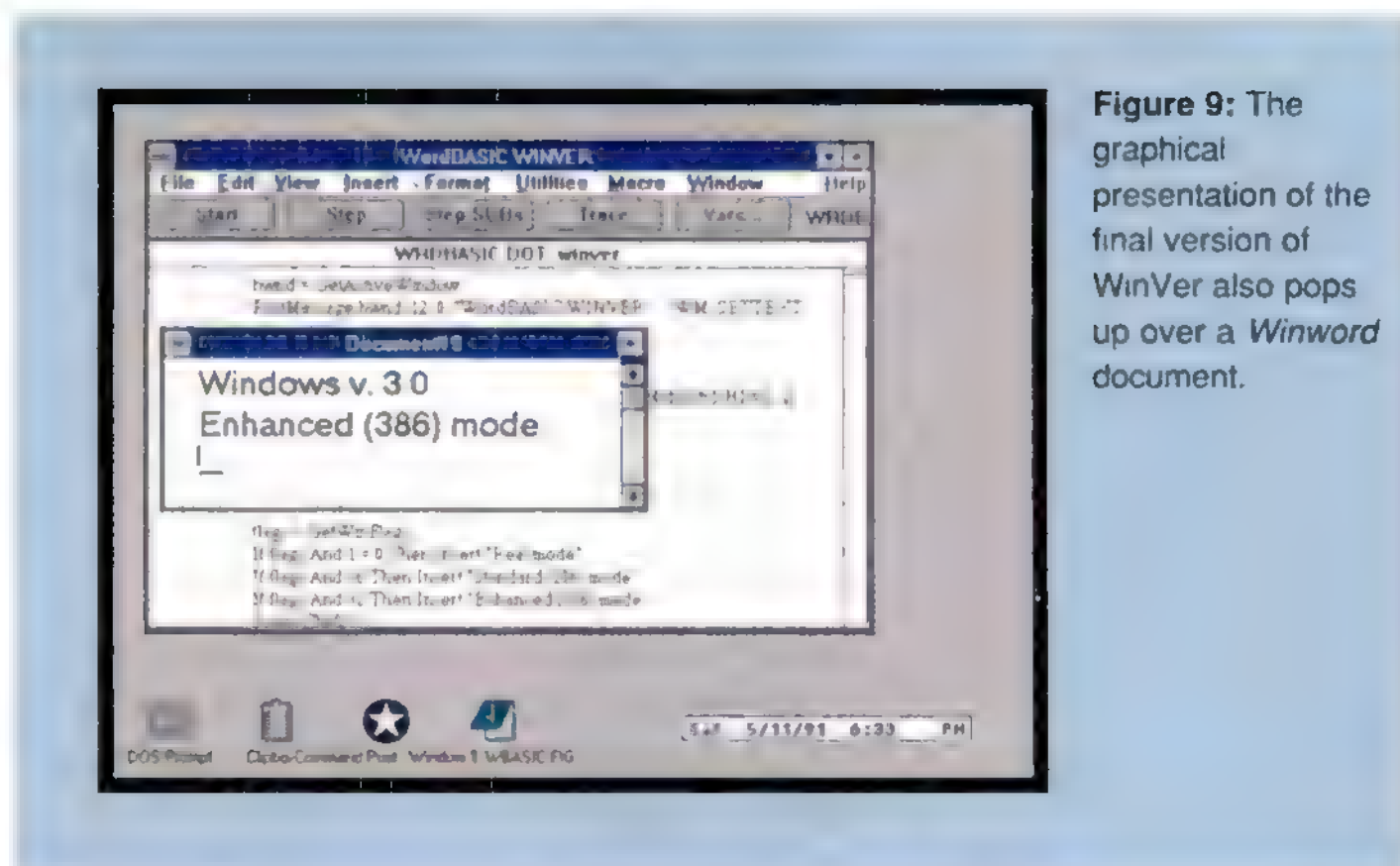


Figure 9: The graphical presentation of the final version of *WinVer* also pops up over a *Winword* document.



Figure 8: The final version of *WinVer* makes use of *Winword*'s graphical output capabilities:

Lab Notes

ers to *structures*. WordBASIC does not have any facility for creating these. (Fortunately, Visual Basic does.)

As noted at the outset, however, there are other BASICs for *Windows* besides WordBASIC. Thus, the limitations of WordBASIC afford an opportunity to examine one of these alternatives briefly.

Realizer from Within Technologies is a complete BASIC development environment for *Windows*. It's also easy to experiment with this product because a "limited" but working version is included with Michael Hyman's recent book *Windows 3.0 for BASIC Programmers* (Reading, Massachusetts: Addison-Wesley, 1991, ISBN 0-201-57031-9, \$29.95).

Unlike WordBASIC, *Realizer* does support standalone programs in separate files. Moreover, because *Realizer's* **EXTERNAL** statement (similar to the **DECLARE** statement in WordBASIC) supports unsigned as well as signed quantities, you can use it in places where WordBASIC won't do. As an example, Figure 12 presents a short *Realizer* program called DESKEXT.RLZ. This program calls a number of functions from the *Windows* USER and GDI modules to determine the logical screen coordinates

DYNLINK

COMPLETE LISTING

```

Declare Function LoadLibrary Lib "kernel" (modname As String) As Integer
Declare Function GetProcAddress Lib "kernel" (handle As Integer, \
    funcname As String) As Long

Sub MAIN
    Input "Module name", modname$
    Input "Function name", funcname$

    module = LoadLibrary(modname$)
    If module < 32 Then Goto done ' failed
    funcptr = GetProcAddress(module, funcname$)

    Print modname$; ". "; funcname$; " at "; funcptr; " in module$"; module

    ' No way to _call_ funcptr: that's why we need DECLARE!
done:
End Sub

```



Figure 11: This subroutine illustrates runtime dynamic linking in WordBASIC. The INPUT statement asks you to enter a module name (such as Kernel) and a function name (such as GetVersion).

of the desktop window. You'll find that it is next to impossible to convert this simple program into WordBASIC.

One problem shared by the WordBASIC **DECLARE** statement and the *Realizer* **EXTERNAL** statement is that both assume that you are dynamically linking to functions that use the so-called Pascal calling convention. While the vast majority of *Windows* API functions are in fact set up this way (and are thus accessible from both these BASICs), a few very useful ones use the alternative **cdecl** calling convention, which allows for a variable

number of arguments.

For example, it would have been nice to be able to use the *Windows* `wsprintf()` function to fix a bug that happens to exist in one of the *WinVer* macros. For a hypothetical *Windows* version such as 3.05, *WinVer* would incorrectly display "Windows v. 3.5" rather than the correct "Windows v. 3.05"; to display the version correctly requires either format statements such as "#.##" (which Visual Basic has but WordBASIC doesn't) or a really horrendous **PRINT** statement such as the following:

```

PRINT "Windows v. " + Str$(LO(v))\
    + "." + Chr$(Int(HI(v))/10 + 48)\
    + Chr$(HI(v) Mod 10 + 48)

```

The *Windows* `wsprintf()` function would have been perfect:

```

s$ = Str$(128, " ")
wsprintf s$, "Windows v. %d.%02d",
    major, minor

```

But because `wsprintf()` can take a variable number of arguments and therefore uses the **cdecl** rather than the Pascal calling convention, trying to call this function will cause *Winword* to abort unexpectedly.

This is a relatively minor point, of course. The inability to call **cdecl** functions in a DLL could be easily fixed by endowing the **DECLARE** or **EXTERNAL** statements with a **cdecl** option or some other mechanism for calling functions that can take a variable number of arguments of different types. What's more important is that even at this early date, existing BASICs

TITLEBAR

COMPLETE LISTING

```

REM Titlebar

' declare four Windows API calls (all from USER module) that we'll use
Declare Sub GetWindowText Lib "user" \
    (hwnd As Integer, lpString$, nMaxCount As Integer)
Declare Sub SetWindowText Lib "user" \
    (hwnd As Integer, lpString$)
Declare Sub SendMessage Lib "user" \
    (hwnd As Integer, wMsg As Integer, wParam As Integer, lParam$)
Declare Function GetActiveWindow Lib "user"() As Integer

Sub MAIN
    hwnd = GetActiveWindow ' find WinWord's window handle
    save$ = String$(128, " ") ' allocate a string to hold title bar
    GetWindowText hwnd, save$, 128 ' get the title bar into the string
    Print save$
    SetWindowText hwnd, "this is a test" ' change the title bar
    MsgBox "Look at the title bar" ' tell user to examine the change
    SetWindowText hwnd, save$ ' set it back to original
    AppMinimize ' make WinWord iconic
    wmSetText = 12 ' WM_SETTEXT message
    For i = 0 To 100
        ' SendMessage wmSetText is equivalent to SetWindowText
        SendMessage hwnd, wmSetText, 0, "test #" + Str$(i)
    Next i
    AppRestore ' restore WinWord from iconic state
    SetWindowText hwnd, save$ ' restore title bar to original
End Sub

```

Figure 10: This WordBASIC macro manipulates the *Winword* title bar to restore it after you run *WinVer*.

Lab Notes

```

DESKTOP.RLZ      COMPLETE LISTING

' desktop.rlz

external "user" func GetDesktopWindow () as word
external "user" func GetWindowDC (word) as word
external "user" proc ReleaseDC (word, word)
external "gdi" func GetWindowExt (word) as dword
external "gdi" func GetWindowOrg (word) as dword

func LOWORD(dw)
    return (dw mod 65536)
end func

func HIWORD(dw)
    return (Floor(dw / 65536))
end func

hDesktop = GetDesktopWindow()
hDC = GetWindowDC(hDesktop)
ext = GetWindowExt(hDC)
org = GetWindowOrg(hDC)
Print "desktop window: ", LOWORD(org), HIWORD(org), LOWORD(ext), HIWORD(ext)
' if bail out before execute next line, eventually crash Windows:
' HDCs are a precious resource in Windows; managing them in an interpreted
' environment (or in a debugger) is tricky.
ReleaseDC(hDesktop, hDC)

```

Figure 12: This *Realizer* program calls *Windows* functions that cannot be accessed properly through WordBASIC.

for *Windows* already contain about 90 percent of what we need.

Why is this? What is the connection between BASIC and *Windows*? One obvious link, of course, is Microsoft chairman Bill Gates's well-known affinity for BASIC. There is a far more important reason, however.

Just as most *Windows* applications have a common menu structure (based on the *CUA Advanced Interface Design Guide*), it makes sense for there to be a common macro language. At the same time, *Windows*' provision for multiple tasks that can send messages to each other (and thereby control each other) cries out for a common macro/batch language. In both cases, BASIC seems an obvious choice: Its structure is simple, it is suitable for use as a "batch" language, and a vast number of people already know how to use it. While no such common macro/batch language yet exists, when it does, it will probably look a lot like WordBASIC.

In Part 2 of this article, in the next issue, we'll see that WordBASIC already has many of the facilities needed for a common *Windows* macro/batch language. Its SHELL and SendKeys statements, together with its ability to call the *Windows* SendMessage() and PostMessage() API functions, furnish a solid basis for using WordBASIC as a tool for launching and manipulating other *Windows* applications.

We have already seen how Word-

BASIC statements such as **PRINT** and **INPUT** make it easy to do screen I/O under *Windows*. It remains a mystery why the designers of such an intensely interactive environment as *Windows* made it so difficult for *Windows* programs to produce simple output and get simple input, but at least we know that WordBASIC does a superb job of hiding the difficulty. In Part 2 of this article, we will also see that WordBASIC makes it easy to create dialog boxes to get more complex forms of user input.

CORRECTION

In the June 25, 1991, Lab Notes ("The Programming Challenge of *Windows* Protected Mode"), Andrew Schulman stated that using selector 40h causes an "Unrecoverable Application Error" (UAE) in *Windows* 3.0 Standard and Enhanced modes, and that *Windows* selector __0040H does not map base address 400h. Neither statement is correct; both selector 40h and __0040H map the BIOS data area, and will work in Protected-mode *Windows*, without causing a UAE. We regret any confusion caused by this.—Ed.

Andrew Schulman is an engineer and writer at Phar Lap Software in Cambridge, Massachusetts. Editor of the recently published book Undocumented DOS, he has also contributed to Ray Duncan's book Extending DOS.

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by
John Deurbrouck

Utilities

Nearly 6,700 files make their home in the two partitions and 315 subdirectories of my hard disk. These numbers put no strain on today's PC, of course, but they can make finding a long-unaccessed file a real problem. The directory tools that DOS provides for locating a given program or data file belong to an earlier, less-pressured age.

With the DOS DIR command, you can look at only one drive at a time, and you still can't search the whole partition—you must search each directory individually. Even with the new DOS 5.0, you must go to the root directory of every drive if you want to examine all the directories on your disk. And, of course, you can look for only one filespec group at a time.

The FFF (Flexible File Finder) utility presented in this issue overcomes these primary obstacles and provides a few additional refinements. FFF examines all the directories on all the drives you want, and it lets you target as many different filespecs as you can fit on the command line. The program totals the space used by the files it finds and can search for directories as well as files. FFF provides an extended wildcard syntax that lets you search for types of names DOS wildcards can't describe. And it provides you with a choice of report formats.

You can download the utility and its source code from PC MagNet, as detailed in the PC MagNet News page, which follows this article. I wrote FFF in Borland's Turbo C++, Version 2.0, but it will also compile and run under Version 1.01. In addition, I modified the source code to permit compilation under Zortech C 2.18, Microsoft C 6.00A, Microsoft Quick C 2.51, and Mix Power C 2.0.2. All of the code was run through Gimpel's PC Lint 4.01. If you don't have a modem, you can get a copy of the source code by mail or fax. Simply send a postcard with your name and address (or fax number if applicable) to the attention of Katherine West, Utilities, *PC Magazine*, One Park Avenue, New York, NY 10016; no phone calls, please.

FFF—A Single Command To Find Multiple Files On All Your Drives

■ Here's a utility that lets you search your whole hard disk for as many kinds of entries as you like—all in a single pass.

We've made two FFF executables available on PC MagNet. If you use *Windows*, you'll want to use FFF.EXE, which works both under *Windows* and at the DOS prompt (see the sidebar "FFF Under Windows: Creating a Dual-Mode Program"). If you don't want to run FFF under *Windows*, you might prefer to use the DOS-only version to save disk space (10K versus 60K). If so, look for DOSFFF.EXE. It works exactly the same as FFF.EXE at the DOS prompt but can't be run as a *Windows* application.

FFF IN ACTION

The full syntax for FFF is

```
FFF [/a] [drive(s):] [/d|do]
[/h|ho|hro] [/s] [/l|t|w] name(s)
```

The parameters shown in brackets are optional. Only a specification for *name(s)* must be provided, and this can include multiple entries separated by spaces. The *name(s)* parameter may also consist of or include the FFF extended wildcards explained below. Switch and *name(s)* entries are not case-sensitive and can be entered in any order. By default, FFF limits its search to the current drive. Thus, the command

```
fff *.exe *.com *.bat
```

will report all the executable files on your current drive.

The optional /a switch tells FFF to search all system drives from A: to Z:. Alternatively, you can use the *drive(s):* parameter to specify one or more target drives. Each *range* of drive letters (indicated by a hyphen) must begin with the alphabetically lowest letter, and the last drive specified must end with a colon. However, multiple ranges and individually entered drive letters can be intermixed. For example, if you enter

```
FFF 1-pghc-e: *
```

you'll get a list of the names of all files on drives C:, D:, E:, G:, H:, L:, M:, N:, O:, and P:, in that order.

Note in this example the use of a single asterisk to stand for the *.* you would normally use in DOS (and could use here). This and other minor syntax differences between FFF and DOS will be discussed more fully below. The space shown between the trailing drive colon and the asterisk is optional, though it is required before any switch parameters that begin with a slash (/).

There is another subtle difference between the following two command lines:

```
C:\>FFF /a *
C:\>FFF a-z:*
```

Both report all filenames presently on your system, but only the latter alerts you if it could not access a given drive; for example, if there was no floppy disk in drive A: or if you left the B: door open.

The FFF utility normally searches for

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files only. However, if you want a list of both files and directories that match your *name(s)* specification, you simply add the /d directory switch. To list only directories, use the /do switch, which suppresses the reporting of filenames.

By default, FFF ignores hidden and system files. These can be included with the "normal" files by employing the /h switch. If you want a list of the hidden and system files only, the /ho parameter is the one to use. The /hor switch adds read-only files. Thus, the command

```
FFF * /a /hro /d
```

brings you a list of all the hidden, system, and read-only files and directories on your disk. (Note here that, as indicated initially, the *name(s)* specification need not be placed last, as it was in the previous examples.)

FFF usually starts its searches from the root directory. If you want to limit the search to the current directory and its children, you can do so by using the subdirectory /s switch. For example, suppose that \WINDOWS is the current directory on your C: drive and you want to see all the *Windows* .EXE and .COM files. Even if you're currently on another drive altogether, all you need enter at the DOS prompt is the command

```
fff c: /s *.exe *.com
```

This assumes, of course, that you keep FFF.EXE somewhere on your PATH. And if \WINDOWS were not the *current* directory on drive C:, you'd have to make it so before executing the command.

EXTENDED WILDCARDS

There are subtle differences between the ways DOS and the Flexible File Finder interpret all three of the special DOS filespec symbols: the period, the asterisk, and the question mark.

In DOS, the period is a special character. Searching for * is not the same as searching for *.* , since the former will return only filenames without an extension when you employ the DOS directory-searching function. Accordingly, the command DEL * deletes only the files that do not have an extension. The DIR command is actually an *exception* to the general DOS

rule; it lists all files (with and without an extension) when you enter DIR * on the command line.

FFF does not treat the period as a special character. Therefore, * by itself means "all files," and *.* to FFF means "all files" only because the second asterisk may simply happen to represent anywhere from zero to three characters. Both of these examples parallel the way the DIR command—not DOS generally—works. To FFF, *. means "all files whose names end in a period," that is, all files that have no extension.

For DOS, *A*. means exactly the same thing as *.* . That's because DOS ignores everything in a file specification from the asterisk up to a period (or to the end of the specification). FFF treats the as-

**Extended wildcards
add a significant
amount of functionality
to FFF—so much that if
you use FFF a great
deal, you might find
yourself accidentally
using extended
wildcards with normal
DOS utilities.**

terisk differently. To FFF, an asterisk means any number (including zero) of characters.

Thus to FFF, *A*. means "any files that contain the letter A in the base part of the name, whether the files have an extension or not," and *A* means "any files that contain the letter A in either the name or the extension portion." Consequently, when you tell FFF to search for *C*T*. it means, "Find any files whose basename portion contains the letters C and T in that order." Given this specification, FFF will find files such as CONTRACT.DAT, BILLCAT.UGH, SELECT.COM and ACCURATE.WAG.

This considerably augments your

search capabilities. If you are looking for documentation files on your drive, you might enter

```
FFF *READ*ME*
```

This will find files like READ.ME, README.DOC, FREAD.ME, and README. An even more inclusive search for documentation files anywhere on your entire disk would be

```
FFF *READ* *TXT* *DOC* /a
```

(This assumes you don't use a word processor that commandeers .DOC for its own file extension.)

To DOS, ?? means "any file with zero, one, or two characters in its name." To FFF, on the other hand, ?? means "any file with exactly two characters in its name." This is because DOS interprets the question mark to mean either zero or one character, while FFF sees the question mark as one and only one character.

This difference allows you use the following command:

```
FFF *.??
```

to produce a list of files that have one and only one character in their extensions, such as FFF.H and FFF.C. The question mark guarantees that there is at least one character after the period. By contrast, the DOS command

```
DIR *.?
```

will include files that have no extension.

Extended wildcards add a significant amount of functionality to FFF—so much that if you use FFF a great deal, you might forget the differences and find yourself accidentally using extended wildcards with normal DOS utilities. Normally, this will be harmless. But you should beware of a command like this:

```
DEL *ERROR*
```

In DOS *this* accidental command will delete every file in your current directory that has no extension, not simply those whose filenames have ERROR embedded in them.

FFF REPORTS

The remaining FFF parameter switches—/l (limit), /t (terse), and /w (wide)—are used to set the output format for FFF re-

FFF UNDER WINDOWS: Creating a Dual-Mode Program

by John Deurbrouck

Just as this article was going to press, a beta copy of Microsoft's now-announced *Quick C for Windows* arrived on my doorstep. One neat feature of *Quick C for Windows* that immediately caught my attention was that it lets you compile code written for DOS into real *Microsoft Windows* applications. So I decided to experiment with DOSFFF.EXE. The result is one executable, FFF.EXE, that runs as both a DOS application and a *Windows* application.

Quick C for Windows is a *Windows*-hosted integrated development environment for C that contains graphical tools to draw the user interface. It incorporates *Quick-Case:W*, a window prototyper that automatically generates code for your interface. And its IDE lets you edit, compile, and debug your program without leaving *Windows*.

To compile DOS code into a *Windows* application, you use the *QuickWin* libraries; the notorious complexity of the *Windows* API is hidden and you can use such standard C functions as `printf()` and `gets()` for user interaction. The *QuickWin* libraries do impose a limitation, however, in that under *Windows* only the Standard and 386 Enhanced modes are supported.

I had to modify only a few parts of the DOS source code to accommodate *Windows*. The assembly language routines did have to go. In my DOS-only

implementation of DOSFFF, I had used assembly language code to handle the DOS critical error interrupt generated by open floppy disk drive doors and the like. This code simply wouldn't work under *Windows*, but the similar *Windows* function `SetErrorMode()` replaced it without problems.

Another bit of code I had done in assembly language was BYTPCLUS, the module that reports the number of bytes per cluster on any disk drive. I knew how to code this easily using DOS services, but didn't know how to get the same information from the runtime libraries of the four compilers I was using. For the *Windows* version, then, I used the Microsoft `_dos_getdiskfree()` library function, which works the same in *Windows* applications as in DOS applications.

My last assembly language module was DRV_AB, which reports whether floppy drives A: and B: are logically present. To get this information you must access a byte in low memory. The problem is that in both Standard and 386 Enhanced modes, segment registers are loaded with selectors, not with physical memory addresses. This means that loading arbitrary values into the segment registers is likely to cause a protection violation. Most DOS extenders provide selectors to allow you to access memory addresses in the first megabyte, and experimentation

showed that a selector of 0x0040 gave me access to the BIOS data area. As we go to press, though, this facility is not documented.

To allow the user to enter a command line from within the program, I added the `winuser_second_chance()` function. This function, which is called if no command line arguments are supplied when the program is started, prompts the user for a string. The function then parses the user response into a new `argc` and `argv[]` and recursively calls `main()`. This allowed me to add the new functionality with a minimum of redesign and recoding.

DUAL-MODE EXECUTABLES

The actual process of making FFF a dual-mode DOS and *Windows* executable is not difficult. First, you compile and link the DOS version of the utility (I called it DOSFFF.EXE). You then add the following line to the Definition file for your *Windows* version:

```
INSERT A(17)-1 line
```

This replaces the default stub program, WINSTUB.EXE, with DOSFFF.EXE in the FFF.EXE file. Run from the DOS prompt, WINSTUB.EXE (normally embedded in *Windows* applications) simply prints the message, "This program requires Microsoft *Windows*" on the screen and exits back to the DOS prompt. But binding in a full-function DOS version of the utility instead is simple and gives you a single .EXE file that works correctly both as a DOS program and as a *Windows* program.

All of the code and other files necessary (icon, project file, resource file, definition file, and so on) to reproduce the DOS and *Windows* versions of FFF are included in the source code available through PC MagNet and by mail.

FFF UNDER WINDOWS

Assuming that you keep FFF.EXE in a directory on your DOS PATH, you can run the program from *Windows* simply

CONTINUES

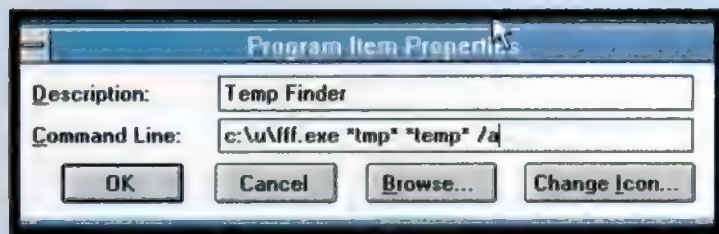


Figure A: Under *Windows*, a copy of Flexible File Finder can be installed incorporating parameters that otherwise would have to be entered each time on the command line.

Utilities

CONTINUED

by choosing File and then Run in the Program Manager, much as you would from the DOS command line. You can also install FFF in the same way you would add any *Windows* application to a program group. This will provide it with an icon.

Installing FFF in *Windows*, you can include command line parameters if you wish. For example, if you want to install a version of FFF that finds all files containing either TEMP or TMP in their names, you might describe it as Temp Finder and set up the program as shown in Figure A.

On the other hand, if you want FFF under *Windows* to be available primarily as a general-purpose tool, don't include any command line parameters after the executable's name when you install it. One difference between executing FFF under DOS and under *Windows* is that if the *Windows* version is run without any command line parameters, it will prompt you for them rather than simply displaying a help screen and exiting. This allows you to just double-click on the program's icon and conveniently enter the command line parameters. An illustration of this interaction and the resulting output is shown in Figure B. Like the DOS version, if the *Windows* version of FFF does not get a valid command line, it shows its usage information.

Once the program has searched the disk for the entries you have specified, it changes the message on the status line from "Running" to "Finished."

If the output listing turns out to be larger than the visible window, FFF

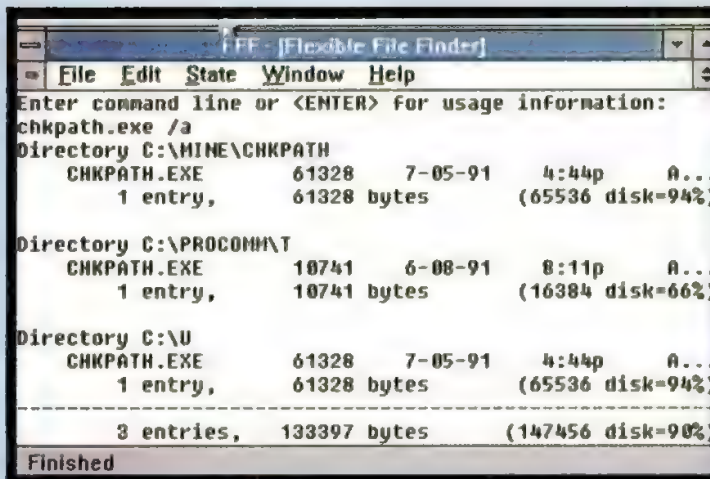


Figure B: An FFF search for all copies of CHKPATH.EXE on all drives yields the same report running under *Windows* as it would under DOS.

will automatically provide you with scroll bars so you can view all of the data. Note that it is possible to scroll through the output even while FFF is still working. If you want to suspend FFF's operations temporarily while it is still working, you can either press Ctrl-S to stop and Ctrl-Q to resume or switch between State Pause and State Resume on the menu bar. FFF actually works faster if you reduce it to an icon while it's searching the disk. The reason for this is that because the output is not being scrolled through the window, which uses up CPU cycles, more CPU horsepower is left to the operation of the program itself.

As a *Windows* application, FFF.EXE is subject to two limitations imposed by the QuickWin libraries used in its compilation by *Quick C for Windows*. First, it will run only in *Windows*' Standard or 386 Enhanced modes. Second, you can run only one copy of the program at once. Thus, if you want to compare the results of two different runs, you'll have to cut the text out and place it into the Notepad. Fortunately, that's a very simple task. In the FFF window, select Edit Select All, then Edit Copy. Then open up a Notepad window and select Edit Paste. Finally, close the FFF window so you can run another FFF session. ■

ports. By default, when none of these three switches is used, the command

```
fff *.ini /d
```

will produce a display similar to that shown in Figure 1.

While most of the information shown in the figure needs no further comment, the four characters in the right-hand column and the bytes calculations shown in parentheses may raise questions. In its default report format, FFF tells you whether the

archive, read-only, hidden, and system attribute bits of a listed file are set. To show the letters, all four were set artificially for the WIN.INI example file. (If you've backed up your disk recently, none of these attribute bits would normally be set for WIN.INI.) When a period rather than the letter is displayed, the corresponding bit is not set.

The subtotal and total lines show both how many bytes are actually occupied by data in files (subdirectories increase the entry count but not the number of bytes used)

and how many bytes DOS has allocated to store that data. Readers who have followed Barry Simon's "Lab Notes" in our last two issues will already be aware that although data is stored in 512-byte sectors, DOS sets aside storage space in multisection clusters. Based on this difference, FFF lets you see how efficiently your disk is being used. In Figure 1, the three files actually have 17,124 bytes of useful data in them. But they take up 32,768 bytes of disk space on my computer. This means that I'm really only getting use out of about

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FFF DEFAULT REPORT

```
C:\>fff *.ini /d

Directory C:\INI
WIN.INI          567      8-31-89   11:52p   ARRS
CSIG.INI         2905     3-07-88   5:10a    .R.S
TOOLS.INI        13652    8-19-90   2:10a    A...
  3 entries,      17124 bytes      (32768 disk=52%)

Directory C:\BOOT
DIRECT.INI       <DIR>     3-15-91   3:15p    ..H.
FILE.INI         <DIR>     3-15-91   3:18p    ....
  2 entries,       0 bytes

-----
  5 entries,      17124 bytes      (32768 disk=52%)
```

Figure 1: In addition to providing standard DOS information, the FFF default report indicates whether the archive, read-only, hidden, and system attribute bits are set and calculates storage efficiency by comparing bytes used to bytes allocated.

52 percent of my disk for these files.

The default report provides the most information. The wide report, shown in Figure 2, is displayed when you use the /w switch. This report format is useful when you want a complete list of all the files meeting your specification but don't need the date, time, and size information. The wide report format will put up to five entries on each line. Note that unlike DOS's DIR /W command, FFF indicates which names refer to directories rather than to files by adding a backslash to the end of the name.

The limited report, shown in Figure 3, is an even more pared-down version of the default report. It is produced by FFF's /l switch. This report format omits the names of the individual entries, but it continues to track the total size and number of directories. If you want to get a quick summary of your disk usage you might do a quick

age on all your disk drives.

If you want a report of all the slack space in your batch files, try

```
FFF *.bat /a /h /l
```

Be prepared for a real eye-opener! And if you want to see how much room Windows takes up on your hard disk, make \WINDOWS the current directory and enter

```
FFF * /h /l /s
```

The final FFF output format, the terse report, is shown in Figure 4. Invoked by using the /t, this report restricts itself to listing fully qualified names of every entry meeting your specification. This is the same format you get from DOS 5.0's DIR /S /B, except that FFF adds a backslash to the end of any directories displayed so that you can tell them from filenames.

PROGRAMMING NOTES

One of the guiding principles I adopted in designing FFF was that programs for gen-

eral use should, where possible, handle DOS critical errors without user intervention. Few program messages are as unfriendly as the infamous DOS "Abort, Retry, Fail?" prompt.

When DOS encounters a critical error—a missing floppy disk or an open floppy disk drive door—it calls a routine that displays that prompt and waits for the user to decide what to do next. FFF handles the DOS critical error interrupt by failing all DOS calls that generate a critical error, as if the user had pressed F in response to the prompt. This allows the program to report problems to the user in a friendlier fashion, or simply to ignore them when they're unimportant or expected.

The first step is to install your own critical error handler. This merely involves pointing interrupt 24h to your error-handling code. It's important also to check the DOS version and modify the handler to return a code appropriate to that version. This is necessary, because Fail was not an option prior to DOS 3.0, and Ignore must be returned instead.

The next task is to check the return codes from all DOS access functions. When you try to change to a different drive, for example, you must check to see whether the drive change was effective before you start taking directory listings. Otherwise, your program will become hopelessly muddled.

The final step is to reinstall the default error handler when you exit. All current versions of DOS reinstall the vector for you when your application exits, effectively rendering this step unnecessary. Still, it's always a good idea to clean up after yourself, if for no other reason than that it builds habits that will stand you in good stead when you intercept vectors DOS doesn't manage.

HOW MANY FLOPPIES?

Because DOS and the BIOS cooperate to simulate the presence of two drives on all single-drive systems, it's possible to do things such as DISKCOPY A: B: even on a one-drive system. When a program needs access to drive B:, DOS prompts the user to enter a disk for that drive and press a key. Then, when the drive is behaving as drive B: and a program needs access to drive A:, DOS prompts the user to enter a disk for drive A:.

In FFF, however, I didn't want the user to be bothered with such prompts when the /a switch was specified. To get around the problem, you must look in several differ-

FFF WIDE REPORT

```
C:\>fff *.ini /d /w

Directory C:\INI
WIN.INI          CSIG.INI          TOOLS.INI
  3 entries,      17124 bytes      (32768 disk=52%)

Directory C:\BOOT
DIRECT.INI\      FILE.INI\
  2 entries,       0 bytes

-----
  5 entries,      17124 bytes      (32768 disk=52%)
```

Figure 2: The FFF wide report format can list up to five entries on a line. Note that directory entries are distinguished from files by a trailing backslash.

PC MAGAZINE UTILITIES UPDATES

Like all good software, the programs presented in *PC Magazine* are upgraded and improved. You can get the modified versions by downloading them from PC MagNet. Here's a partial list of the programs that have been upgraded to fix minor bugs and system incompatibilities:

ANSI.COM, Version 1.3
BAT2EXEC.COM, Version 1.3
BCOPY, Version 1.2
BEN56.ARC (Benchmark Series, Version 5.6)
CARDFILE.COM, Version 1.1
CHKFRAG.EXE, Version 1.2
CMDEDIT.EXE, Version 2.1
CONFIG.CTL, Version 3.0
DIRMATCH.COM, Version 2.0
EMMA.COM, Version 2.2
EMS40.SYS, Version 1.1
PANDORA.COM, Version 1.5a
PCACCESS.COM, Version 1.1
PCMANAGE.EXE, Version 1.1
PCREMOTE.COM, Version 1.1
RN.COM, Version 2.0
SCHEDULE.COM, Version 1.1
SLICE.COM, Version 1.3
SNIPPER.COM, Version 1.2
TPFST-AT.COM, Version 1.1
ZCOPY.COM, Version 1.2

For a complete list of all the programs available from the PC MagNet Software and Utilities Database Library, download UDCAT.ARC.

A downloadable index to *PC Magazine's* product reviews is also available. PCM.EXE is a self-extracting file that contains the *Computer Library PC Magazine Reviews Index* for January 1988 to December 1990. It requires the search files in PCSRCH.EXE. Please read the information file PCM.INF before you download any of these files.

These programs are copyrighted. You may make copies for others as long as no charge is involved. However, making copies for any commercial purpose is prohibited.

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John Deurbrouck

FFF Command

October 15, 1991 (Utilities)

Purpose:

A file- and directory-finding utility that can search all directories on any or all drives for one or more target filespecs. Extended wildcards, size and attribute-byte information, and multiple report formats are supported.

Format:

FFF [/a] [drive(s):] [/d|do] [/h|ho|hro] [/s] [/l|t|w] name(s)

Remarks:

The *name(s)* parameter may consist of multiple entries (separated by spaces) on the same command line. Thus, FFF *.exe *.com *.bat will find all executable files on the current (default) drive.

In FFF, the * stands for 0 to *n* characters, the ? for one and only one character; the period is treated specially as an ordinary character. Thus *.* and * both mean "all files," and *.* restricts a listing to files that have at least a one-character extension. Combinations such as *C*T* are permitted, facilitating finding files with a base name that has (in this case) a C and a T in that order.

All other parameters are optional and are not sensitive to case or entry order. The /a switch causes FFF to search all system drives in alphabetical order. One or more drives may be specified, singly, in ranges, or intermixed, by entering a *drive(s):* parameter. This parameter must end with a colon, and included range(s) of drives (for example, c-e:) must begin with the lowest-letter drive in the group.

By default, searches begin from the root directory of the drive(s) specified; the /s switch restricts the search to the current subdirectory and its children. The /d switch returns directories as well as files that match *name(s)*; /do lists matching directories only. The /h switch adds hidden and system files; /ho restricts the listing to hidden and system files; and /hro reports hidden, system, and read-only files in addition to normal files.

The default FFF report lists files and directories found under their parent directories and supplies file size, date and time, and attribute-byte (Archive, Hidden, System, Read-only) information on each. File size and allocation size totals are also supplied, and a storage efficiency percentage is calculated. The /w (wide) switch reports entries individually, five across. The /l (limited) switch lists number of entries and total and allocated file space. The /t (terse) switch reports fully qualified names only.

Utilities

```
FFF LIMITED REPORT

C:\>fff *.ini /d /q

Directory C:\INI
  3 entries,      17124 bytes      (32768 disk=524)

Directory C:\BOOT
  2 entries,        0 bytes
-----
  5 entries,      17124 bytes      (32768 disk=524)
```

Figure 3: Using the /l switch produces a limited report that simply summarizes disk usage.

ent places to determine whether a single-drive system is in use and, if so, to which drive the physical drive is currently set.

The first step is to ask the BIOS for the equipment word. This information is stored at memory location 0040:0010, but is better accessed through interrupt 11h. Among other information, this word tells you whether there are floppy disk drives on this system. If there are, the least-significant bit is set, and the most significant 2 bits in the least-significant byte indicate the number of floppies.

If the equipment word indicates the presence of one and only one floppy disk, the next step is to determine its current logical assignment. This information is maintained by DOS, but it is stored in the BIOS data area, at offset 0050:0004, and there is no way to get it but by looking at memory directly. If the value of this byte is 0, the floppy is accessible as drive A.; if the value is nonzero, the floppy is accessible as drive B:. If you wanted, you could also change the assignment of the drive by changing that byte. For FFF, however, I decided that if the user wanted to look at A: or B: on a single-floppy system, I would search whichever drive was currently present. The output will still indicate which drive was actually accessed, and this check makes the program a bit friendlier.

```
FFF TERSE REPORT

C:\>fff *.ini /d /t

C:\INI\WIN.INI
C:\INI\CSIG.INI
C:\INI\TOOLS.INI
C:\BOOT\DIRECT.INI\
C:\BOOT\FILE.INI\
```

Figure 4: The /t or "terse" report displays fully qualified names of files and directories, the latter of which are given a trailing backslash for easier identification.

CONTROLLING COMPLEXITY

This utility was written in the same manner as many small programs: by accretion. The basic functionality was implemented, after which features were added as their need became apparent. Such a programming method is beneficial in that it produces a usable product early in the development cycle, so you can get users testing it. It is dangerous, however, in that it is easy to fall into a quick-fix trap, making tricky modifications to add new features. This can leave you with a program that is very hard to read and maintain.

One point at which this conflict surfaced in developing FFF was in the area of attribute handling. The first version of the program incorporated the /h switch, which specifies whether the user wants to see hidden and system files. I handled this by setting a global variable, `wants_hidden`, which was nonzero when the /h switch was present on the command line. Then I tested this switch when I built my attribute byte for the `findfirst()` function. Everything worked just fine.

The next thing I added was the ability to search for directory names as well as filenames. This was more complex because I still had to handle the /h switch correctly, and now I had to tell `findfirst()` to give me directory names as well. This forced further modification to the attribute byte sent to `findfirst()` and necessitated more testing on each file returned from `findfirst()` and `findnext()`, since you can't tell DOS to return *only* directories, which is what you want when the /do switch is present.

At this point, it became obvious that a more general approach to attribute-byte handling was needed. The solution I adopted was to maintain 3 bytes of information about file attributes. The variable names are `search_attr`, `attrib_must_have`, and `attrib_have_one`. I constructed a truth table (listed in FFF.C as a comment)

that shows the attributes each byte should have for the various combinations of /h, /ho, /hro, /d and /do. `search_attr` contains the mask for all files I want DOS to return. Any required attributes (for example, the directory attribute for the /do switch) are contained in `attrib_must_have`. Finally, `attrib_have_one`, if nonzero, contains attributes (like the hidden or system attribute with /ho) at least one of which any entry must share in order to qualify.

SPEED VS. FLEXIBILITY

DOS provides a service that allows a program to browse through a directory. The client program can specify a filename or wildcard, and DOS will return only files that match.

If you wanted all the files that start with AB, you could give DOS a filespec of `AB*.*`, and you'd get the list you wanted. Or, you could give DOS the filespec `*.*`, look at each returned file, and then throw out the ones you didn't want. Both approaches yield the same result, but the latter method is about half as fast.

Since FFF provides an extended wildcard syntax, you can pass it specifications like `*AB*` and get the result you want. Using DOS, if you wanted to look for more than one filename, `*.*` would be the only way to get the job done.

FFF tries to get the best performance it can by calling DOS with a limited specification when possible. Specifically, when the user requests only one name and that name is representable as a normal DOS wildcard, FFF will use the faster approach. When extended or multiple names are present, though, FFF must request `*.*` and examine each returned name to see whether it is one the user wants to see.

One final programming note may be helpful. As you develop your options, it's tempting to adopt suggestions from beta users that increase "flexibility" by providing more than one way to accomplish the same job. As the number of really desirable options grows, however, any redundant flexibility can quickly become bewildering complexity that may discourage a prospective new user from even trying to learn to use the utility.

I hope that FFF succeeds in covering all bases necessary for file searching, while at the same time giving you an unambiguous path down the first baseline. ■

John Deurbrouck is a C and 80x86 assembly programmer who works on PC platforms in Mountlake Terrace, Washington.

Cocaine lies.

After nearly a decade of being America's glamour drug, researchers are starting to uncover the truth about cocaine.

It's emerging as a very dangerous substance.

No one thinks the things described here will ever happen to them. But you can never be certain. Whenever and however you use cocaine, you're playing Russian roulette.

You can't get addicted to cocaine.

Cocaine was once thought to be non-addictive, because users don't have the severe *physical* withdrawal symptoms of heroin—delirium, muscle-cramps, and convulsions.

However, cocaine is intensely addicting *psychologically*.

In animal studies, monkeys with unlimited access to cocaine self-administer until they die. One monkey pressed a bar 12,800 times to obtain a single dose of cocaine. Rhesus monkeys won't smoke tobacco or marijuana, but 100% will smoke cocaine, preferring it to sex and to food—even when starving.

Like monkey, like man.

If you take cocaine, you run a 10% chance of addiction. The

risk is higher the younger you are, and may be as high as 50% for those who smoke cocaine. (Some crack users say they felt addicted from the *first time* they smoked.)

When you're addicted, all you think about is getting and using cocaine. Family, friends, job, home, possessions, and health become unimportant.

Because cocaine is expensive, you end up doing what all addicts do. You steal, cheat, lie, deal, sell anything and everything, including yourself. All the while you risk imprisonment. Because, never forget, cocaine is illegal.

There's no way to tell who'll become addicted. But one thing is certain.

No one who is an addict, set out to become one.

C'mon, just once can't hurt you.

Cocaine hits your heart before it hits your head. Your pulse rate rockets and your blood pressure soars. Even if you're only 15, you become a prime candidate for a heart attack, a stroke, or an epileptic-type fit.

In the brain, cocaine mainly affects a primitive part where the emotions are seated. Unfortunately, this part of the brain also controls your heart and lungs.

A big hit or a cumulative overdose may interrupt the electrical signal to your heart and lungs. They simply stop.

That's how basketball player Len Bias died.

If you're unlucky the first time you do coke, your body will lack a chemical that breaks down the drug. In which case, you'll be a first time O.D. Two lines will kill you.

Sex with coke is amazing.

Cocaine's powers as a sexual stimulant have never been proved or disproved. However, the evidence seems to suggest that the drug's reputation alone serves to heighten sexual feelings. (The same thing happens in Africa, where natives swear by powdered rhinoceros horn as an aphrodisiac.)

What is certain is that continued use of cocaine leads to impotence and finally complete loss of interest in sex.

It'll make you feel great.

Cocaine makes you feel like a new man, the joke goes. The only trouble is, the first thing the new man wants is more cocaine.

It's true. After the high wears off, you may feel a little anxious, irritable, or depressed. You've got the coke blues. But fortunately, they're easy to fix, with a few more lines or another hit on the pipe.

Of course, sooner or later you have to stop. Then—for days at a time—you may feel lethargic, depressed, even suicidal.

Says Dr. Arnold Washton, one of the country's leading cocaine experts: "It's impossible for the nonuser to imagine the deep, vicious depression that a cocaine addict suffers from."



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Newsbytes, a Daily Update On the PC Industry, Starts

The *Newsbytes* computer news summary is now available on PC MagNet.

Published Monday through Friday, *Newsbytes* is a daily report on the latest developments within the computer business.

Microcomputers, mainframes, minicomputers, networking, telecommunications, technology, publications, legal, and government issues all serve as information targets on-line. *Newsbytes* has seven

U.S. and seven international bureaus devoted to gathering significant consumer technology news.

Newsbytes is part of a growing family of reports that provide the latest news. Spencer F. Katt, who writes *Rumor Central*, the *PC Week* insider's journal, is also available.

Type GO NEWSBYTES at any prompt to access the largest on-line industry news network.

Arcade-Style Game Is a Real Showstopper

In response to the tremendous success of the *Commander Keen* arcade-style game, Apogee Software Productions has released a new shareware showstopper.

Duke Nukem is the name of the latest science fiction adventure, and it goes above and beyond *Commander Keen* in terms of action, graphics, and animation.

The year is 1997, and you are protagonist Duke Nukem, hired by the CIA to rid Shrapnel City of the demented genius Dr. Proton. All you have is a pistol, grappling hooks (if you can locate them) and an attitude. Nuclear reactors, surveillance cameras, teleporters, time machines, elevators, and villainous techbots are all obstacles you have to contend with on your mission.

Duke features four-way, dual-scrolling playfields with clean graphics, and animation updating at 48 frames

per second. The ample graphics display large, animated characters, reflections, and curious detail.

Other perks include arcade sound effects, joystick support, built-in hint mode, the ability to save and restore, and a high-scores board.

This game has a superior look and feel over its predecessor, the fantastic *Commander Keen*. The shoot-'em-up premise may be a little clichéd, but the action and intriguing side encounters keep things interesting. It is certainly fun and sure to be a thorn in the side of real-world productivity.

DUKE.ZIP can be downloaded from PC MagNet's AfterHours Forum (GO AFTER), in DL3, Games.

While you can download the complete game on PC MagNet, the shareware cost is \$15, which should be sent directly to the author.

You may also order the next two chapters of Duke Nukem's adventures through an Apogee catalog, included within the zipped file archive.

—Chris Parker

- **NEWSBYTES:** The latest computer industry news is now available daily.
- **DUKE NUKEM:** Arcade-style shareware game from the folks who brought you *Commander Keen*.

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Using voice: Dial 800-635-6225. Follow the instructions and note the number.

by
Charles Petzold

Environments

Something remarkable has happened to the world of computer graphics since its origin about three decades ago. Computer graphics started out entirely oriented around vector drawing. Early output devices were vector displays and pen plotters. Graphics programming meant drawing lines. Pick up any classical or academic book on graphics programming and you'll find that it almost exclusively focuses on the mathematics of line drawing.

Yet particularly in recent years, we've seen a dramatic shift in emphasis from vector graphics to raster graphics. This is not to say that vector graphics is losing its importance; it's still vital for CAD and for scientific and business graphing. But as we use bitmapped images in an attempt to bring real-world (or very complex) images to our computer screens, raster graphics has certainly been gaining in importance.

This trend probably results from the ever-dropping cost of memory, the availability of processors and operating systems to manage this memory, and output devices able to render high-detail, many-color images. Hardware evolution has made the storage and rendering of bitmaps feasible, and we've found that we like looking at bitmaps on our computer screens. The forthcoming world of the *Windows* Multimedia Extensions makes heavy use of bitmaps.

THE NEW LOOK OF BUTTONS

Bitmaps are showing up in unusual places. Programmers have often used iconlike bitmapped buttons in paint programs; now they're also becoming popular in dialog boxes. For example, take a look at Figure 1, which shows a typical dialog box in Borland's exciting Turbo Pascal for *Windows* (TPW) environment.

These TPW dialog boxes function the same way as normal *Windows* dialog boxes, but they certainly don't look the same. In particular, look at the fancy bitmapped push buttons for OK and Cancel.

In recent months, several people have

Bitmaps and Buttons: Creating Customized Dialog Boxes

■ As raster graphics increases in importance, bitmaps are showing up in some unusual places.

asked me how to duplicate such dialog boxes. Well, it's not so easy. If you run EXEHDR (included with the Microsoft C 6.0 compiler) on TPW.EXE, you'll see some exported entry points with names such as BORBUTTONDPROC and BORRADIOWNDPROC. These names indicate to me that the Borland programmers have rewritten many of the standard controls to give them a new look.

On the other hand, if what you really

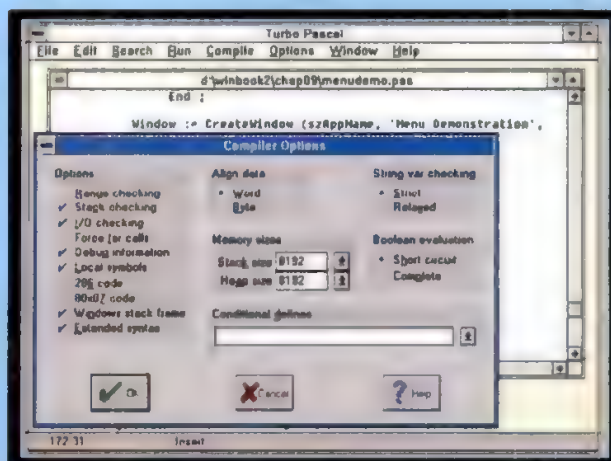
want to do is use customized bitmaps for push buttons, that's not so difficult. The trick is to use the new *owner-draw* button style introduced in *Windows* 3.0. Unfortunately, my book *Programming Windows* (Microsoft Press, 1990) doesn't contain a discussion of the owner-draw style, because it wasn't documented in the beta releases of *Windows* 3.0 until long after I had finished the chapters where it would have been discussed.

In this column, I'm going to rectify that omission by showing a program called OWNERDRW, which uses bitmaps for push-button items in a dialog box.

DESIGNING NEW BUTTONS

Before you go crazy creating customized push buttons for all your dialog boxes, first decide whether this is really desir-

Figure 1: A dialog box from Borland's Turbo Pascal for *Windows* showing custom controls and bitmapped buttons.



Environments

able. After all, the whole rationale behind a consistent user interface is that users don't have to learn the rudiments of each new application they encounter. Certainly the OK and Cancel push buttons normally used in *Windows* dialog boxes are familiar and easily recognizable. Borland's compromise in TPW is to retain the text and add a bit of flash. But it's easy to conceive of push buttons for OK and Cancel that might make a user hesitate and wonder what the buttons mean.

Just to demonstrate the extremes you might be tempted to take this to, I decided to illustrate customized push buttons in OWNERDRW with two images from classical art. (Well, why not?)

For the Cancel push button, the choice seemed clear: the face from Edvard Munch's *The Scream*. An image for the OK button was not so obvious. After some deep thought, I decided to use the angelic face from Botticelli's *Birth of Venus*.

To avoid the problems of rendering complex color schemes, I scanned both bitmaps from black-and-white reproductions and used standard VGA colors in the bitmap color table. The reproductions were very small, so I used a scanning area of 0.64 by 0.64 inches and scanned at 100 dots per inch to create 16-color 64-by-64 bitmaps.

OWNERDRW demonstrates the use of these two bitmaps in a dialog box invoked when you close the program. Normally such a dialog box would ask, "Do you want to close the OWNERDRW program?"

OWNERDRW.MSC

COMPLETE LISTING

```
-----
# OWNERDRW.MSC make file for Microsoft C 6.0
#-----

ownerdrw.exe : ownerdrw.obj ownerdrw.def ownerdrw.res
               link ownerdrw, /align:16, NUL, /nod alibcew libw, ownerdrw
               rc ownerdrw.res

ownerdrw.obj : ownerdrw.c ownerdrw.h
               cl -c -Gsw -Ow -W3 -Zp ownerdrw.c

ownerdrw.res : ownerdrw.rc ownerdrw.h venus.bmp munch.bmp
               rc -r ownerdrw.rc
```



Figure 3: The OWNERDRW.MSC file is a Make file for the Microsoft C 6.0 compiler and the Windows 3.0 SDK.

OWNERDRW.BCP

COMPLETE LISTING

```
-----
# OWNERDRW.BCP make file for Borland C++ 2.0
#-----

ownerdrw.exe : ownerdrw.obj ownerdrw.def ownerdrw.res
               tlink /c /n /Tw /Ld:\borlandc\lib csws ownerdrw, ownerdrw, NUL, \
               /nod cwins cs import, ownerdrw
               rc ownerdrw.res

ownerdrw.obj : ownerdrw.c ownerdrw.h
               bcc -c -w-par -W ownerdrw.c

ownerdrw.res : ownerdrw.rc ownerdrw.h venus.bmp munch.bmp
               rc -r -id:\borlandc\include ownerdrw.rc
```



Figure 4: The OWNERDRW.BCP file is a Make file for the Borland C++ 2.0 compiler.

In keeping with the silly nature of this exercise, my dialog box reads simply "Cool to close?" This is shown in Figure 2.

The red outline around the Botticelli face of Venus indicates the button with the input focus. As usual, when you press the Tab key the focus shifts between the two buttons. When you press a button with the mouse or with the Spacebar, the image of the buttons inverts.

THE OWNERDRW FILES

Does this seem like something you'd want to do in your *Windows* programs? If so, note that the source code for OWNERDRW is shown in Figures 3 through 8.

You'll also need the two bitmaps for OK and Cancel. I've referenced them in the OWNERDRW.RC resource script as VENUS.BMP and MUNCH.BMP. You can download all the OWNERDRW source code (including these two bitmaps and the OWNERDRW.EXE executable) from PC MagNet. (See the PC MagNet News page immediately following the Utilities column for downloading instructions.)

Due to popular demand, beginning with this column any C code that I show for *Windows* will be compilable either under Microsoft C 6.0 with the *Windows* 3.0 Software Development Kit or under the Borland C++ 2.0 compiler. In most cases, adding Borland compatibility will involve only supplying alternate Make files. The Microsoft Make file is in Figure 3 and has an extension of MSC; the Borland Make file is in Figure 4 and has an extension of BCP.

If you have all the necessary OWNERDRW files and the Microsoft tools



Figure 2: The dialog box in OWNERDRW uses faces from Botticelli's *Birth of Venus* and Munch's *The Scream* for the OK and Cancel push buttons.

Environments

installed, you can create OWNERDRW.EXE by running

```
NMAKE OWNERDRW.MSC
```

on the DOS command line. If you're using the Borland C++ compiler, create OWNERDRW.EXE by running

```
MAKE -fOWNERDRW.BCP
```

Note the dash and lowercase *f* preceding the Make file name.

THE OWNERDRW RESOURCE SCRIPT

Let's take a look at the OWNERDRW.RC resource script first. Near the top of the script, which is listed in Figure 6, you'll see two lines that include the two bitmaps as resources in the program:

```
OkBitmap      BITMAP venus.bmp
CancelBitmap   BITMAP munch.bmp
```

The RC.EXE resource compiler will include these two bitmaps in the OWNERDRW.EXE executable. The program can then load them using the LoadBitmap function and the bitmap names "OkBitmap" and "CancelBitmap."

The menu definition is quite simple

and includes only two items (Exit and About OwnerDraw) that invoke dialog boxes. The definition of the About dialog box is normal. The Exit dialog box looks normal except for the inclusion of the BS_OWNERDRAW style in the definition of the two push buttons.

With the BS_OWNERDRAW style, Windows will handle all the functionality of the push buttons, but it won't actually draw the buttons. This is left up to the application, as we'll see shortly. (The OWNERDRW.C program draws the buttons by displaying the appropriate bitmaps on the dialog box.)

As you know, coordinates and sizes in dialog box templates are defined in spe-

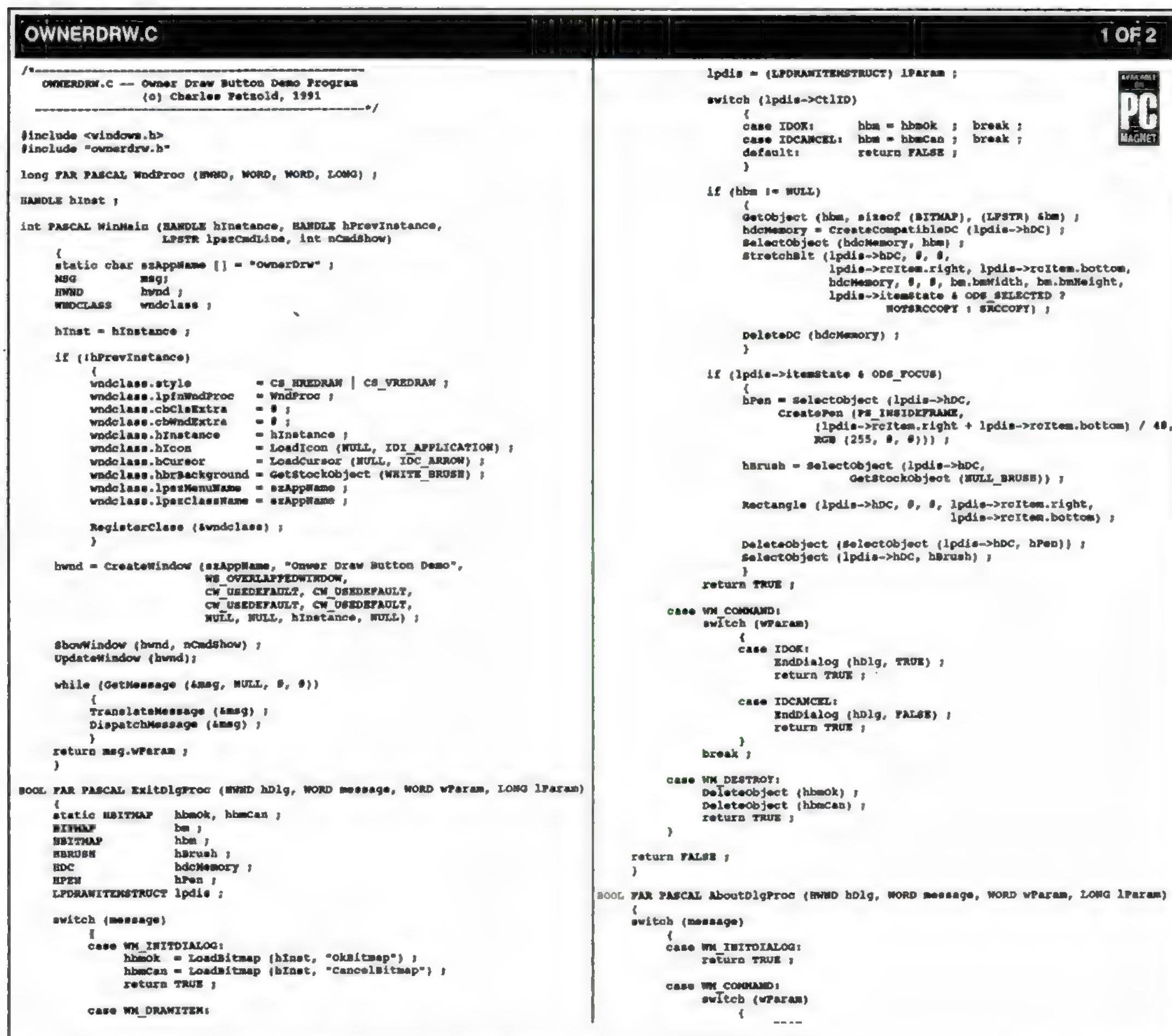


Figure 5: OWNERDRW.C contains all the source code for the program.

OWNERDRW.C

2 OF 2

```

        case IDOK:
        case IDCANCEL:
            EndDialog (hDlg, 0);
            return TRUE;
        }
        break;
    }
    return FALSE;
}

long FAR PASCAL WndProc (HWND hwnd, WORD message, WORD wParam, LONG lParam)
{
    static FARPROC lpfnExitDlgProc, lpfnAboutDlgProc;

    switch (message)
    {
        case WM_CREATE:
            lpfnExitDlgProc = MakeProcInstance (ExitDlgProc, hInst);
            lpfnAboutDlgProc = MakeProcInstance (AboutDlgProc, hInst);
            return 0;

        case WM_COMMAND:
            switch (wParam)
            {
                case IDM_EXIT:
                    SendMessage (hwnd, WM_CLOSE, 0, 0);
            }

            return 0;

        case WM_CLOSE:
            if (DialogBox (hInst, "ExitBox", hwnd, lpfnExitDlgProc))
                DestroyWindow (hwnd);
            return 0;

        case WM_QUERYENDSESSION:
            if (DialogBox (hInst, "ExitBox", hwnd, lpfnExitDlgProc))
                return 1;
            return 0;

        case WM_DESTROY:
            FreeProcInstance (lpfnExitDlgProc);
            FreeProcInstance (lpfnAboutDlgProc);
            PostQuitMessage (0);
            return 0;
    }

    return DefWindowProc (hwnd, message, wParam, lParam);
}

```

cial units: Horizontal coordinates and sizes are in units of one-quarter of the average width of system-font characters. Vertical coordinates and sizes are in units of one-eighth the height of system font characters. These special units let you define dialog boxes that maintain approximately the same appearance on different video displays.

When you're using bitmaps for dialog box buttons, you want the bitmaps to be about the same physical size (at least in relationship to the system font character size) regardless of the display adapter on which the program is running. You can easily do this by defining the size of each button in the dialog box template with normal dialog box units and later using StretchBlt in the program to display the bitmap in that size.

On the other hand, you probably want to create bitmaps optimized for the most common video adapter used for *Windows* and define the button size in the dialog box template accordingly. This is probably the VGA in a 640-by-480 resolution. With a little experimentation, you'll find that each dialog box unit (both horizontal and vertical) is exactly equal to 2 pixels when *Windows* displays the dialog box on a VGA.

Therefore, the bitmaps are 64 by 64 pixels in size, and the buttons in the Exit dialog box are given a 32-by-32 unit size.

THE OWNERDRW SOURCE CODE

The OWNERDRW.C source code file shows all the code necessary to implement bitmapped owner-draw push buttons. The WndProc and AboutDlgProc functions are normal, so I'm not going to

bother discussing them here.

The ExitDlgProc function contains all the special owner-draw code. When the dialog box is invoked from WndProc, WM_INITDIALOG is the first message it receives. ExitWndProc takes this opportunity to call LoadBitmap twice to load the two bitmaps into memory.

LoadBitmap returns handles to the loaded bitmaps. These handles are saved in static variables named hbmOk and hbmCan. Let's skip the WM_DRAWITEM message for now.

ExitWndProc receives a WM_COMMAND message when the user selects either the OK or Cancel push button. As

OWNERDRW.RC

COMPLETE LISTING

```

/*-----
  OWNERDRW.RC resource script
  -----*/

#include <windows.h>
#include "ownerdrw.h"

OkBitmap    BITMAP venus.bmp
CancelBitmap BITMAP munch.bmp

OwnerDrw MENU
{
    POPUP "&File"
    {
        MENUITEM "&Exit...",          IDM_EXIT
    }
    POPUP "&Help"
    {
        MENUITEM "&About OwnerDrw...", IDM_ABOUT
    }
}

AboutBox DIALOG 20, 20, 160, 80
    STYLE WS_POPUP | WS_DLGMFRAME
    {
        CTEXT "OwnerDrw"                -1, 0, 12, 160, 8
        CTEXT "Owner Draw Button Demo Program" -1, 0, 36, 160, 8
        CTEXT "(c) Charles Petzold, 1991"    -1, 0, 48, 160, 8
        DEFPUSHBUTTON "OK"                IDOK, 64, 60, 32, 14, WS_GROUP
    }

ExitBox DIALOG 20, 20, 160, 80
    STYLE WS_POPUP | WS_DLGMFRAME
    {
        CTEXT "OwnerDrw"                -1, 0, 12, 160, 8
        CTEXT "Cool to Close?"          -1, 0, 26, 160, 8
        PUSHBUTTON ""                    IDOK, 32, 42, 32, 32, WS_GROUP | BS_OWNERDRAW
        PUSHBUTTON ""                    IDCANCEL, 96, 42, 32, 32, WS_GROUP | BS_OWNERDRAW
    }

```

Figure 6: OWNERDRW.RC is the program resource script.

Environments

```
OWNERDRW.H
-----
/*
  OWNERDRW.H header file
  -----*/

#define IDM_EXIT      1
#define IDM_ABOUT     2
```

Figure 7: The OWNERDRW.H header file defines constants used in both the source code and the resource script.

```
OWNERDRW.DEF
-----
;
; OWNERDRW.DEF module definition file
;
NAME            OWNERDRW

DESCRIPTION      'Owner Draw Button Demo (c) Charles Petzold, 1991'
EXETYPE         WINDOWS
STUB            'WINSTUB.EXE'
CODE            PRELOAD MOVEABLE DISCARDABLE
DATA            PRELOAD MOVEABLE MULTIPLE
HEAPSIZE        1024
STACKSIZE       8192
EXPORTS         WndProc
                ExitDlgProc
                AboutDlgProc
```

Figure 8: OWNERDRW.DEF is the program module definition file.

usual, ExitWndProc calls EndDialog to destroy the dialog box. During the WM_DESTROY message, ExitWndProc deletes the two bitmaps by calling DeleteObject. Thus, the two bitmaps exist in memory only when the dialog box is active.

PROCESSING WM_DRAWITEM

A button defined with the BS_OWNERDRAW style does not draw itself. Instead, the button sends its owner window a WM_DRAWITEM message whenever the button needs to be drawn. For a button defined in a dialog box template, this message goes to the dialog box procedure. The lParam message parameter that accompanies this message is a far pointer to a structure of type DRAWITEMSTRUCT. Various fields in this structure help the program draw the button.

- DRAWITEMSTRUCT has nine fields, but you need to look at only four of them to draw customized buttons:

- TheCtlID field contains the ID of the push button ID number. In the case of the OWNERDRW program, this will be either IDOK or IDCANCEL.

- ThehDC field contains a handle to a device context suitable for drawing the button.

- ThercItem field contains the size of the push-button window in pixels.

The itemState field contains the state of the push button encoded in bit fields that you can test using identifiers beginning with the prefix ODS. In particular, you need to know whether the ODS_SELECTED bit is set (in which case the user is currently pushing the button with the mouse or Spacebar) and whether the ODS_FOCUS bit is set (in which case the button has the input focus).

OWNERDRW.C begins processing the

of the type BITMAP. The program creates a memory device context, selects the bitmap into it, and calls StretchBlt to display the bitmap on the button window in the dialog box. Note that OWNERDRW.C obtains the destination size (the size of the button) using the rcItem field of the DRAWITEMSTRUCT structure, and the source size (the size of the bitmap) using the bmWidth and bmHeight fields of the BITMAP structure.

If the ODS_SELECTED bit of the DRAWITEMSTRUCT itemState field is not set, OWNERDRW.C uses the SRCCOPY raster operation in StretchBlt to draw the bitmap normally. If the ODS_SELECTED bit is set, OWNERDRW uses the NOTSRCCOPY raster operation to invert the bitmap.

The next step is to draw the red rectangle (or whatever you want to use) to show that the button has the input focus. If the ODS_FOCUS bit in the itemState field of the DRAWITEMSTRUCT is set, OWNERDRW.C creates a red pen with the PS_INSIDEFRAME style. (This style ensures that the sides of the rectangle are drawn within the rectangle dimensions.) The width of the pen is the width plus the height of the button divided by 40. This technique makes the pen width relatively device-independent. The pen is selected in the device context as well as a NULL_BRUSH to prevent GDI from filling the rectangle. The hPen and hBrush variables store the pen and brush objects previously selected in the device context.

Next, OWNERDRW.C draws the focus rectangle using the Rectangle function. It cleans up by restoring the hPen and hBrush

WM_DRAWITEM message by casting lParam into a far pointer of type LPDRAWITEMSTRUCT. Depending on whether the CtlID field is IDOK or IDCANCEL, OWNERDRW.C sets the hbm variable to either hbmOk or hbmCan.

Next, OWNERDRW.C gets the size of the bitmap by calling GetObject. The size of the bitmap is stored in a structure

BIT SETTINGS IN THE ITEM ACTION AND ITEM STATE FIELDS		
	itemAction	itemState
When buttons are created		
Focus button	ODA_FOCUS ODA_DRAWENTIRE	ODS_FOCUS ODS_FOCUS
Nonfocus button	ODA_DRAWENTIRE	
When the focus changes		
Losing the focus	ODA_FOCUS ODA_DRAWENTIRE	
Gaining the focus	ODA_FOCUS	ODS_FOCUS
When a button is selected		
	ODA_SELECT	ODS_FOCUS and ODS_SELECTED
When a button is unselected		
	ODA_SELECT	ODS_FOCUS

Figure 9: This table shows the settings of the appropriate bits in the itemAction and itemState fields during various button transitions.

by
Ray Duncan

Power Programming

Inside C++: Friend and Virtual Functions, and Multiple Inheritance

We've already spent four columns talking about C++ and comparing its features with C, yet believe it or not, we've barely scratched the surface of this strange yet powerful object-oriented programming language (OOP). As we've seen, exploiting the full range of C++'s capabilities requires quite a different mode of thinking from that of traditional C programming, but—unlike most other OOPs—C++ is a hybrid, multiparadigm language. This means that you can continue to use your C++ compiler as a somewhat fancier C compiler and introduce C++ constructs into your source code incrementally as you find the time and energy to do so.

After I've completed this column, I'm going to put C++ aside for a while. But I don't want to leave it behind without mentioning three more important features: friend functions, virtual functions, and multiple inheritance.

Friend functions are functions that have access to the member functions and member variables in a class (and its antecedent classes) without actually being declared as member functions of that class. This is useful when you want to be able to call a particular function from within two or more unrelated classes to operate on their instance variables without actually duplicating the function in both classes. To create such a friend function, just prototype it in all the class definitions to which you want to give it access, using the **friend** keyword, then define the function elsewhere.

For example, say you have a simple function `rotateXY()` that can rotate a point (x,y) around the origin by an amount in radians, and you make it a friend of the class `POINT` with code in the following general form:

```
// definition of class POINT
class POINT {
    int X;
    int Y;
public:
```

■ Examining a few more C++ features before moving on to look at some errata and readers' letters.

```
    friend void rotateXY(double
degrees);
};

void rotateXY(double degrees)
{
    ...
}
```

Now it's possible to use `rotateXY()` as though it were a member function of class `POINT`:

```
POINT pointA(10,10);
pointA.rotateXY(45);
```

But the usual C++ class scoping rules don't apply to `rotateXY()`. You can use it with an object of any other class for which it is a friend function as well, and it will work the same way. C++ also supports friend classes and even friend operators with a similar declaration syntax.

While the operation of friend functions is not hard to grasp, the concept of *virtual functions* is considerably more slippery. In order to talk about virtual functions we need to introduce the ideas of early binding and late binding. Early binding you already know about, because

if you're a C programmer, it's the only kind that's supported directly by the language—and more than likely the only kind you've ever used. When you reference one function from another in C and the compiler converts that reference into a `CALL` instruction, there's never any real ambiguity about the destination of that `CALL`. As long as you understand C's rules for visibility of a function name within a module and between modules, you can predict exactly what the linkage between the functions is going to be, and this linkage is laid down in concrete either at compile time (if the two functions are in the same module) or at link time (if the functions are in different modules). You can escape from this C straitjacket slightly with the use of function pointers, but the responsibility is yours to ensure that the function being called can handle the parameters it's being called with.

In late binding, the linkage between the calling function and the called function isn't made until the application runs. This is the norm rather than the exception in pure object-oriented programming languages such as Smalltalk, but it's a rather jarring notion to a C programmer. When you want late binding in C++, you have to ask for it by declaring a member function with the **virtual** keyword. When you reference such a virtual function, it's as though the C++ compiler leaves a hole to be filled in later, relying on some magical agent to look around in the class hierarchy at runtime for a function with the same name and the most appropriate parameter and result types, and then call that function. The mechanism isn't

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nearly so inefficient as I've made it sound; what actually happens is that the C++ compiler lays down an indirect CALL through a pointer rather than a direct CALL, and this pointer is fixed up at runtime to resolve the reference and "bind" the caller to the callee.

Early binding is the default in C++ to make it more C-like and make the transition easier for C programmers. None of the C++ example programs we've seen in this column so far have used late binding, and for good reason: A nontrivial, practical example of virtual functions requires several pages of code and is really too complex to discuss in this column. However, understanding the use of virtual functions is crucial to reaping the full benefits of C++. Thus, I commend to you the discussion of virtual functions in Scott Robert Ladd's very readable book *Turbo C++ Techniques and Applications* (M&T Publishing Inc., Redwood City, California, 1990).

C++'s support for *multiple inheritance* is one of its more controversial characteristics. In most other OOPs, you can think of the class hierarchy as a tree; there's a simple fundamental class that serves as the root of the tree, and all other classes in the environment are descendants of that one class. With such a scheme, you can always understand everything about the behavior of a class by looking at that class's functions, the functions of its parent, the functions of its parent's parent, and so on until you reach the root of the tree. The relationships between C++ classes can be a tree, but they can also be a network: When you define a new class, it doesn't have to be derived from some other class, and on the other hand, it can inherit member functions and member variables from two or more completely unrelated classes.

The language's syntax for the latter is, as you'd probably expect from our previous encounters, ugly. The OOP gurus are still arguing over whether multiple inheritance is a bug or a feature of C++, because the presence of multiple inheritance and virtual functions makes it possible to design inadvertent ambiguities into your program that can't be detected until runtime.

In the next few columns, we'll move onward from C++ to kinder, gentler

programming topics. There are a variety of interesting new technical issues I'd like to write about: DOS 5.0 and its upper-memory-block support; OS/2, Version 2.0; NT OS/2, a.k.a. OS/2, Version 3.0 (which may be called something else entirely by the time you read this); and DPML, Version 1.0, to name just a few. In addition, I've got a stack of programming tools several feet high waiting to be explored, including Watcom's new C/386 (which can generate 32-bit *Windows* applications), Visual Basic, *Realizer*, and MASM, Version 6.0. But first, it's time to account for some bugs in past columns and to peek into the electronic mailbag.

ERRATA AND BUGS

On page 390 of the February 26, 1991,

OOP gurus are still
arguing over whether
multiple inheritance is
a bug or feature of
C++, because its
presence makes it
possible to design
inadvertent
ambiguities into
your program.

issue of *PC Magazine*, at the top of the right-hand column, I listed four MS-DOS interrupts not supported by *Windows* 3.0's built-in DOS Extender. The interrupt numbers were listed correctly, but the description of INT 20h as Get Real Mode Interrupt Vector was completely bogus. INT 20h is, of course, the "old" Terminate Program function, still supported in real-mode MS-DOS but now effectively superseded by INT 21h, function 4Ch, Terminate Program with Return Code.

A bigger problem with that column and the one that followed it was the failure to make clear a crucial distinction between *Windows* 3.0's Standard mode and 386 Enhanced mode. In Standard mode,

the DOS Extender is present, but you can't get at it from a non-*Windows* application because *Windows* 3.0 doesn't export the full DPML interface, including the mode switch function. A character-based program can't switch into protected mode, so it's effectively locked out from using the DOS Extender. (*Windows* applications are launched in protected mode, so they don't have this problem.) Only if your character-based program is running in a DOS box in 386 Enhanced mode can it make the leap to protected mode and use *Windows*' built-in DOS Extender. I regret the amount of time many readers wasted trying to get TINYDOSX.ASM and its test program TESTDOSX.C to run in Standard mode.

Finally, on page 388 of the March 12, 1991, column, the routine ERROR contained a nasty bug that (so typically) was introduced when another part of the program was "improved." The correct code is:

```
error: pop    bx
       push   bp
       mov    bp, sp
       or     word ptr [bp+6], 1
       pop    bp
       mov    ax, 1
       iret
```

THE ELECTRONIC MAILBAG

Several readers took me to task for my column about The Whitewater Group's Actor programming language, which appeared in the March 26, 1991, issue. Kip Irvine wrote the following:

I read your recent article "Actor: A Development Environment for *Windows* Applications" with some interest because I've been using Actor to write a rather large *Windows* application for the past year and a half (a database/graphics program that displays and graphs British mutual funds). For this reason, I think I have a fairly realistic notion of Actor's strong and weak points.

I disagree with your reservations about learning yet another language. Most applications programmers I know are used to learning new languages. It helps them to be more flexible and to draw on the strengths that various languages offer. Since Actor is a pure OOP language, it made learning object-oriented programming easier for me: I couldn't conveniently fall back on procedural programming habits I'd formed in the past, and had to learn to think in a new way.

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Yes, Actor is memory-hungry, particularly because of the size of the IMA (image) files. This is the characteristic I like the least. Of course, resources can be stored in the .EXE file, and many Actor classes can be removed from the IMA during the seal-off process.

Actor's late-binding feature is one of its greatest strengths. This enables me to configure my application's behavior at runtime—redefining the types of database fields, for example. Its execution speed is excellent, surprising in view of its dynamic binding of objects and types. You can force early binding on objects to improve their access and write assembly language primitives that link into the IMA file.

The Browser editor is without a doubt the best programmers' editor I've used. I generally work with two or three browsers at a time and depend on the class hierarchy window to find my way around. You said your screen seemed cluttered, but I often need to cut and paste text from one window to another or compare lines from different methods.

You thought the Actor syntax was awkward, since it was neither C nor Pascal. At first, I would have agreed with you. After about a month, though, Actor's way of doing things actually seemed more natural. For example, strings may be concatenated with a + sign rather than by using strcpy. And Actor contains a convenient way to perform operations on a collection. To use a trivial example, we could concatenate a collection of strings thus:

```
astr := "";  
do(aCollection, (using(elt)  
    astr := astr + elt;  
));
```

Actor's rich collection of classes and methods is one of its greatest assets. In particular, the implementations of Collections, SortedCollections, Streams, and various types of window classes proved to be a real convenience, allowing me to become a *Windows* programmer a lot faster than I would have believed.

Your comments about the speed of compiling weren't consistent with my experience. I use a lethargic 20-MHz 386 with a 29-millisecond hard disk and 2MB of RAM, and it generally takes about 2 or 3 seconds to compile a method. A snap-

shot takes about the same. Compare this with the amount of time it would take to exit *Windows*, compile a C module, link it, and reenter *Windows*! One factor that may have affected your timings: Actor uses a static swapping scheme by default, to save memory. I always turn this feature off to improve performance and still have never run out of memory.

I found Actor to be remarkably free of bugs. Its first releases were a little more shaky, but then so was *Windows* 2.0. When bugs were found, Whitewater's technical support people were extremely helpful.

By the way, I have no particular allegiance to The Whitewater Group. I've used Borland's products for years, written applications with TurboPower Software's

Actor uses a static swapping scheme to shoehorn large applications into real mode in order to save memory. Disabling this feature will improve performance, making compilation almost instantaneous.

Object Professional, and also teach assembler, Pascal, C, COBOL, and BASIC at Miami-Dade Community College.

In a similar vein, Douglas Allen wrote the following letter:

Your review of Actor misses the mark. Compilation will be almost instantaneous if you disable static swapping, which is used to shoehorn large applications into real mode. Garbage collection should take about one-eighth the time. It need be done only when memory runs low and isn't necessary prior to saving and quitting a session. Users can eliminate most of Actor's clunky features by doing minor system

enhancements. The Whitewater Group is inefficient about collecting and distributing these among their customers.

You imply that an OOPL should supply all possible functionality as it comes out of the box, without using any space. Our three years of programming with Actor have shown us that it's worth the price just for the ability it gives us to manage our own code. Real-world Actor applications are efficient and perform well. Novice programmers can learn Actor in far less time than it takes to understand how to program *Windows* in C. To make full use of Actor, programmers should obtain the manuals that come with the *Windows* SDK, or an equivalent book, as well as a Dialog editor.

I appreciate the time these two readers took to write and clarify some important points about Actor (I completely overlooked the effect of static swapping on performance; it wasn't prominently documented in the manuals). Upon further reflection, though, I feel that in general my overall assessment of Actor is even more true today than it was in March. Now that there are several mainstream GUI-based programming languages available for *Windows*—Turbo Pascal for *Windows*, Smalltalk V for *Windows*, Visual Basic, and *Realizer*—there's even less reason to stake your development efforts on an idiosyncratic, single-source, memory-hungry language like Actor.

In my April 30, 1991, column about WordBASIC and DDE, I griped that the *Microsoft Word for Windows* package contains virtually no documentation of WordBASIC, and that you have to purchase a technical reference manual for WordBASIC from Microsoft Press separately. Dr. Michael Gordon of Denison University wrote to tell us about some other resources:

There's another source for information on WordBASIC, a text entitled *Using WordBASIC for Word for Windows and Word for OS/2* by WexTech Systems. The 150-page manual comes with a pamphlet, *Microsoft Excel Dialog Editor: An Application for Creating Custom Dialog Boxes for Microsoft Excel Macros*, and a disk entitled *Using WordBASIC Companion Disk Ver. 1.1*. Best of all, the package is free! A toll-free phone call to Microsoft, and it came by Federal Express in two days. Customer service isn't really familiar with it, so it's best to give the part number (059-

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050-574). While the product is free, Microsoft did want to charge for shipping and handling, but I was able to get that waived. Well worth a look.

Jim Presley wrote to point out an embarrassing gaffe in my first column about C++ (July 1991):

From the reading I've done, the definition for *polymorphism* is a little different from what you gave in your article. Grady Booch defines it as "a concept in type theory, according to which a name may denote objects of many different classes that are related by some common superclass." Thus, any object denoted by this name is able to respond to some common set of operations in different ways.

The way I understand it, polymorphism denotes different objects of different classes responding to the same message in a manner appropriate to each object—an integer object, a string object, and a floating-point object that all respond to the same print message, for example. I'd consider a single print object that handles various data arguments more an example of overloading than of polymorphism.

Mr. Presley is, of course, correct, and my remarks about polymorphism in the July column only illustrate the extreme danger of writing about complex subjects in an off-the-cuff manner and too close to deadline! Incidentally, I highly recommend Grady Booch's book entitled *Object Oriented Design with Applications*, published by Benjamin/Cummings Publishing Co., Redwood City, California, 1991. To anyone interested in OOP: The book is beautifully written.

With regard to the *Windows* virtual memory management I discussed in my June 11, 1991, column, Don Corbitt (a Microsoft software developer) wrote:

I thought it would be worthwhile to emphasize something you may have heard already: The ugly stack frame you complain about in your article isn't needed for applications that run *only* in protected mode under *Windows*. A recommended stack frame would be as follows:

■ **Near Call**—as in MS-DOS, BP frame required only for parameters or local variables:

```
nearp proc near
    push bp      ;optional
    mov bp, sp   ;optional
    ...
    pop bp       ;optional
    retn
```

■ **Far Call**—as in MS-DOS, BP frame required only for parameters or local variables:

```
farfp proc far
    push bp      ;optional
    mov bp, sp   ;optional
    ...
    pop bp       ;optional
    retf
```

Polymorphism denotes different objects of different classes responding to the same message in a manner appropriate to each object.

■ **Far Callback**—DS must be set, but INC BP not needed:

```
wfarfp proc far
    push ds
    pop ax
    nop
    push bp      ;optional
    mov bp, sp   ;optional
    push ds
    mov ds, ax
    ...
    pop bp       ;optional
    pop ds
    retf xxxx
```

Optionally, "smart callbacks," which remove the need for export or MakeProcInstance(), can be used:

```
wfarfp proc far
    push bp      ;optional
    mov bp, sp   ;optional
    push ds
    push ss
```

```
pop ds
...
pop ds
pop bp      ;optional
retf xxxx
```

These techniques will work with *Windows* 3.0 and 3.1. The only potential loss is that some debuggers expect the odd bp stack frame. However, debuggers using ToolHelper.DLL will handle this correctly. Getting rid of the INC BP and most of the load DS will improve the speed of *Windows* and reduce the size of *Windows* apps. I'm recommending not supporting Real mode in any future apps that people write.

This is information I've read in the *Windows* 3.1 SDK documentation, which is currently in beta test. However, it's basically what I deduced before coming to work for Microsoft last fall. I don't have the authority to speak for Microsoft nor tell you about future development plans. I believe this to be correct and useful information, but I make at least my share of mistakes. (There, is that enough disclaimers?)

Finally (and this is not a joke), I received the following somewhat mysterious letter about the TINYDOSX.ASM program in the March 12, 1991, issue:

Dear Sir:

Under the title "Creating a DPMI-Based DOS Extender of Your Own," am I missing something or are you? Isn't TINYDOSX an intended "virus" without all the "self-control" and damaging insertions? While I think all programmers need to be hackers of a sort, isn't it best to leave the keys to experienced trained drivers, until one becomes a trained driver?

On the other side, needing work as a consultant, and having my own PC, isn't TINYDOSX a first step in simulating OS/2 so an OS/2 application could run under DOS?

Sincerely,
UJC

I Be Me an IRU

P.S. Can 286/386/486 emulate IBM 370/360 instruction set? Could OS be then put on a PC?

THE IN-BOX

Please send your questions, comments, and suggestions to me at any of the following e-mail addresses:

PC MagNet: 72241,52

MCI Mail: rduncan

BIX: rduncan

by
Fran Finnegan

Windows

HELPING WORD FOR WINDOWS FIND .DOC FILES

Can you help me with a question that the people on Microsoft's help line could not answer? I keep my .DOT and .DOC files in a separate directory named C:\DATA\WORD. The following statement in my WIN.INI file lets *Word for Windows* automatically find the .DOT files:

```
[Microsoft Word]
DOT-PATH=C:\DATA\WORD\
```

Oddly enough, the statement `DOC-PATH=C:\DATA\WORD\` doesn't automatically help *Word for Windows* find my .DOC files. Right now I have to set the path in a *Word for Windows* dialog box manually each time I open or save a .DOC file for the first time during a session. Do you know how I can let *Word for Windows* know where I keep my *.DOC files?

Paul D. Hass
Fullerton, California



It is odd that *Word for Windows* allows you to specify WIN.INI entries that lead it to WINWORD.INI, *.DOT files, and its various utility files, but not one for .DOC files. One solution lies in a *PC Magazine* utility named WINEXT that appeared in the June 25, 1991, issue. It provides the functionality to do what you want to do. Since the complete syntax of the Program Manager Command Line entry or WIN.INI [Extensions] entry required by WINEXT is described in that issue, I'll just summarize the entries you need to handle your particular situation.

I'm assuming that you start *Word for Windows* from the Program Manager. If you use WINEXT with the Program Manager, the following Program Item Properties Command Line will start *Word for Windows* and put you in your C:\DATA\WORD subdirectory:

```
winext.exe c:\data\word
winword.exe *
```

- **HELPING WORD FOR WINDOWS FIND .DOC FILES:** A *PC Magazine* utility lets you tell *Word for Windows* where you keep your .DOC files.
- **EXITING WINDOWS QUICKLY:** There's an easy way to blow away all your non-*Windows* applications when you want to exit quickly.
- **USING SYSEDIT ON DIFFERENT FILES:** By modifying SYSEDIT.EXE with a binary-file editor, you can use it to load a different set of four files.

This line executes WINEXT, passing it the data directory you want to be in when *Word for Windows* starts up. WINEXT changes into the requested directory and then starts WINWORD. If WINWORD.EXE is *not* on your PATH (which is okay with WINEXT), you should substitute WINWORD's fully qualified filename for winword.exe so that WINWORD can be found by WINEXT.

If you want to start WINWORD without a blank initial document, the Command Line should be:

```
winext.exe c:\data\word
winword.exe /n *
```

And if you'd like WINWORD to start as a maximized window, use the following:

```
winext.exe + c:\data\word
winword.exe /n *
```

You can download WINEXT.EXE, or WINEXT.ZIP (which includes complete

instructions), from PC MagNet.

A second solution is to use the following Program Item Properties Command Line in Program Manager:

```
c:\data\word\winword.exe
```

This approach *requires* that WINWORD be on your PATH. The Command Line is built by appending winword.exe to the start-up directory in which your .DOC files reside. Program Manager will tell you that the above path is invalid, but you can ignore the message and hit the OK button. The path is invalid, in a way: WINWORD is not in that .DOC-file directory. But running the command like this makes the data directory the current working directory, then executes WINWORD—just what you wanted!

EXITING WINDOWS QUICKLY

I have a problem when I want to exit *Windows 3.0* in a hurry. *Windows* requires you to close all active non-*Windows* applications first. A message box titled DOS says "Application still active; exit the application and then try closing *Windows*." This can be a very tedious task, and I've often been asked to find a way around it. I'd be very grateful if you could suggest a feasible solution to this problem.

Amir Ben-Natan
Raana, Israel



It is possible to blow away all your non-*Windows* applications in a hurry when you want to exit *Windows*, but you'll have a hard time finding this feature in the index of the *Windows* user guide. In Real and Standard modes, where task switching and the resulting screen repainting are annoying and time-consuming, you can circumvent them by using the *Windows 3.0* Task Manager (TASKMAN.EXE) to terminate DOS sessions and applications.

To accomplish this, double-click on your *Windows* wallpaper or enter Ctrl-Esc. Either of these actions will bring up

Windows

the Windows Task List dialog box. Successively select each DOS session and hit the End Task button.

Be careful, though! As the *Windows* documentation notes on page 490, use the End Task command with extreme caution. Terminating an application this way can result in lost data. If you have *any* doubt about whether data needs to be saved, you should exit the DOS application the normal way. But if you're sure that a DOS session doesn't contain an executing application with active data that hasn't been saved, you can terminate the task without any further steps.

USING SYSEDIT ON DIFFERENT FILES

In the May 14, 1991, issue, you stated that there's no way to configure the *Windows* 3.0 SYSEDIT utility to handle any files but the four whose names are hard-coded into SYSEDIT, that is, C:\CONFIG.SYS, C:\AUTOEXEC.BAT, SYSTEM.INI, and WIN.INI. It is possible, though, to modify the *names* of the files in SYSEDIT using a disk-sector editor such as the hex editors in *PC Tools* or *The Norton Utilities*.

First, decide which four text files you'd like to display. There are two sets of restrictions relating to the files you choose.

- The first two files must be located in your main *Windows* subdirectory, and their names must be the same length or shorter than those of the files they're replacing (SYSTEM.INI and WIN.INI).

- The next two files must either be located on your PATH (so that you don't have to qualify their filenames), or their fully or partially qualified names must be the same length or shorter than those they are replacing, c:\config.sys and c:\autoexec.bat. (Note that you'll see the filenames as lowercase strings when you look at SYSEDIT with a hex editor.)

Now make a copy of SYSEDIT.EXE to use with your new set of files. Choose an .EXE filename that will be meaningful to you in light of the four files you'll be using it with. It's this new copy you'll be editing.

With your binary-file editor, look in the the .EXE file for the string \system.ini (it's located at offset 1AE6h). Beginning at this location, you'll see the four original filenames separated by hexadecimal 0s (00h). Replace system.ini with a new filename, leaving the preceding \ where it is. Do the same with your second file, replacing win.ini. For the last two files, there's no \ to retain, so your new filenames can begin at the position of the drive letter c. If any of your filenames are shorter than the originals, pad them with hexadecimal 0s.

Say you want to create a new file (INIEDIT.EXE) that would allow you to bring up your primary *Windows* .INI files quickly. You could retain the first two filenames, and simply replace the last two with PROGMAN.INI and CONTROL.INI. When you run this new version of SYSEDIT, you'll find your specified files in four editing windows.

Joseph Alexander
Riyadh, Saudi Arabia



There's one binary file editor nearly everyone has—DEBUG—and if you're going to use it, there are a few things to note. You can't use DEBUG on an .EXE file, so you'll need to change the extension before loading the file into DEBUG. It always loads files at an offset of 100h so, in this case, the initial offset would be 1BE6h (see the listing in Figure 1).

Putting *each* filename at the correct position is important too—it's not enough that they occupy the same space as a whole. In DEBUG, the addresses of the other three filenames are 1BF2h, 1BFBh, and 1C09h.

This procedure will also make SYSEDIT useful for people who don't keep their CONFIG.SYS and AUTOEXEC-

.BAT files on the C: drive. You can just patch the c at file offsets 1AFBh (1BFBh in DEBUG) and 1B09h (1C09h in DEBUG) to a new drive letter.

The restrictions on the filenames relate to how SYSEDIT is written. These filenames are just static null-terminated C strings. SYSEDIT asks *Windows* what the main *Windows* subdirectory is (usually C:\WINDOWS), and appends the \system.ini and \win.ini (or your new filenames) for the first two files. It's too bad SYSEDIT wasn't written to be a little smarter, since this is unnecessary. When a *Windows* application opens a file that's not qualified with path information (as just WIN.INI would be), *Windows* searches in the main *Windows* subdirectory (and SYSTEM subdirectory) in addition to the PATH. So, it would find WIN.INI no matter what the current directory is. The unnecessary prepending of the main *Windows* subdirectory forces you to use SYSEDIT with two files from this subdirectory.

The same file-opening procedure applies to the last two files. If they aren't qualified in any way, *Windows* will look for them in the main *Windows* and SYSTEM subdirectories and anywhere along the PATH. If the file you want to edit can be found that way, simply enter its filename and extension in lieu of c:\config.sys or c:\autoexec.bat. Removing the unnecessary c:\ lets you use this space for your filenames, so you can give each a full eight-character name.

One further restriction is that the total size of all four files opened by SYSEDIT must be less than about 56K.

A final change you can make involves the SYSEDIT backup filename extension of syd, which you'll find at offset 1B1Ah (1C1Ah in DEBUG). You could change it to BAK or to anything else you might prefer.

OPENING WINDOWS

Share your *Windows* experiences and we'll pay \$50 for any tip we print. Mail your contributions on a disk, along with a printout, to *Windows*, *PC Magazine*, One Park Avenue, New York, NY 10016, or e-mail them (re: PC Magazine) to: PC MagNet: 76244,145 (see page 10 for access instructions); MCI Mail: Fran Finnegan; BIX: franfinnegan; GENIE: finnegan; Internet: finnegan@well.sf.ca.us. We regret that we are unable to acknowledge submissions or answer questions individually.

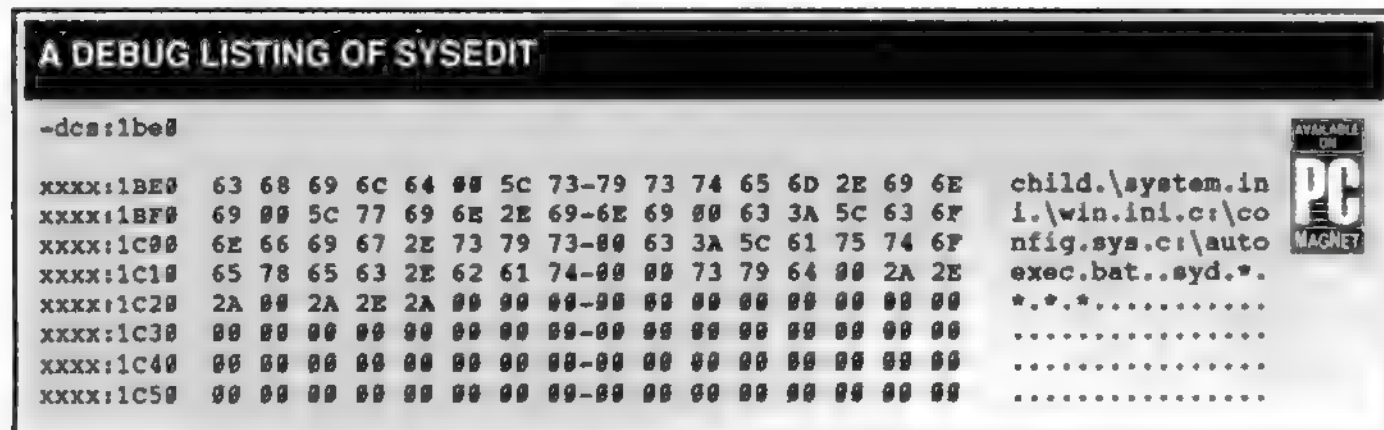


Figure 1: This dump shows the location of the four filenames the SYSEDIT utility can access.

by
Sal Ricciardi

Databases

MANIPULATING DATES IN CLIPPER

Clipper includes the DTOS() function, which accepts a date variable and returns a string formatted as YYYYMMDD. However, the package does not provide a function that reverses this process, so I took it upon myself to write a user-defined function named, appropriately, STOD(). In Figure 1's DATES2 program, STOD() is called by another UDF named EOM(), which returns the last date of the month for any valid date passed to the function.

EOM() starts by assuming that the last date of any month is the 31st. It then uses STOD(), *Clipper*'s EMPTY() function, and a DO LOOP to work backward a day at a time until a valid date is returned.

An application designed to prorate rents or costs over a calendar year or to determine end-of-month due dates must know the last day of (or number of days in) a given month. I'm sure there are many other applications that also need this information.

Robert C. Ashcraft
Christiansburg, Virginia

■ **MANIPULATING DATES IN CLIPPER: Reversing the DTOS() function and finding the last day of the month.**

■ **CHECKING FOR LEAP YEARS REVISITED: This method is portable across many implementations of dBASE.**



It does seem odd that no package provides the opposite of DTOS, which takes a date variable and converts it to a string with a fixed format. Yet it's reasonable to suppose that you might need to reverse the process. If so, STOD does the job.

The EOM example function, which uses STOD, shows that it is sometimes convenient to rely on a failure condition. For example, the

```
DO WHILE EMPTY(STOD(pdate))
```

statement relies on the fact that STOD will fail (that is, return an invalid, empty value for dates that aren't valid). For each such failure, the date variable pdate is backed up one until a valid date is found, starting with 31, then 30, then 29, and so forth.

The EOM user-defined function illustrates a sample use of STOD; however, there's a better way to determine the last date of the month.

Recall that *Clipper* supports date arithmetic (as do all dBASE-compatible implementations). You can perform calculations using dates: subtracting dates, adding to dates, and so forth. Since the first date of a month is always known (all months begin with 1), you can determine the last day of a month by finding the first date of the month that follows and subtracting 1. Subtracting 1 from 02/01/90 yields 01/31/90, for example. In a leap year such as 1992, subtracting 1 from 03/01/92 will yield 02/29/92. The EOMD function, shown in Figure 2, takes this approach.

DATES2.PRG	COMPLETE LISTING
<pre>***** * DATES2.PRG * Demonstrates STOD and EOM functions for Clipper ***** CLEAR SCREEN ? "Enter No Date to quit ..." ? DO WHILE .T. ACCEPT "Date > " TO mdate !! Get date IF EMPTY(mdate) !! Nothing means quit RETURN ENDF mdate=CTOD(mdate) !! Convert to date type IF EMPTY(mdate) !! If conversion failed ? "Bad Date!" LOOP !! Try another ENDF mdate = EOM(mdate) !! Get last date of month ? "Last Date of Month:",mdate ? "Number of Days in Month:",DAY(mdate) ENDDO ***** * Function STOD - String to date conversion (reverse of DTOS()) * * Usage: d = STOD(dstr)</pre>	<pre>* * dstr = A character string that holds a date in DTOS format: YYYYMMDD * (Clipper's DTOS() function creates such a string) * * Returns d, which is dstr converted to a date value * * This is the complement to Clipper's DTOS() function. ***** FUNCTION STOD PARAMETERS dstr RETURN CTOD(SUBSTR(dstr,5,2)+"/"+SUBSTR(dstr,7,2)+"/"+LEFT(dstr,4)) ***** * Function EOM - Return the last date of the month * * Usage: d = EOM(mdate) * mdate = Any valid date * * Returns d, a date variable containing the last valid date of the * month ***** FUNCTION EOM PARAMETERS pdate pdate = LEFT(DTOS(pdate),6) + "31" !! Start with the 31st DO WHILE EMPTY(STOD(pdate)) !! If not valid, back up one pdate = LEFT(pdate,6) + STR(VAL(RIGHT(pdate,2))-1,2) ENDDO RETURN STOD(pdate) !! Return a date variable</pre>

Figure 1: The DATES2 program, which demonstrates the STOD and EOM functions, converts a formatted date string to a date and determines the last valid date in a month.

Databases

THE EOMD() FUNCTION	COMPLETE LISTING
<pre>***** * Function EOMD - Return the last date of the month * * Usage: d = EOMD(mdate) * * mdate = Any valid date * * Returns d, a date variable containing the last valid date of the * month ***** FUNCTION eomd PARAMETERS pdate RETURN IIF(MONTH(pdate)<12, ; CTOD(STR(MONTH(pdate) + 1, 2) + "/01/" + STR(YEAR(pdate))) - 1, ; CTOD("12/31/" + STR(YEAR(pdate))))</pre>	

Figure 2: EOMD, a user-defined function, accepts a date and returns the last date of the month. It works by determining the first date of the following month and then subtracting 1.

The easiest way to determine the month that follows is to use the MONTH() function (which extracts the month portion of a date) and then add 1. MONTH()+1 works fine for the first 11 months. But if the date were in December, this procedure would return 13, so December is explicitly tested for and treated as a special case. If the month is December, the second part of the IIF simply returns "12/31" and the year.

The EOMD function also works with *FoxPro* and *dBASE IV*.

CHECKING FOR LEAP YEARS REVISITED

I've seen many methods for testing for leap years, including those published in "Checking for Leap Years" (Databases, March 26, 1991). Whatever the method, it must account for this caveat: A year is a leap year if it is evenly divisible by 4—with one exception. If the year ends in 00, it is not a leap year unless it is divisible by 400. For example, 1600 and 2000 are leap years; 1500 and 1700 are not.

Some leap-year testing methods include:

■ Calculating the long way:

```
IF year % 400 = 0
    RETURN .T.
ELSEIF year % 4 = 0 .AND. ;
year % 100 > 0
    RETURN .T.
ELSE
    RETURN .F.
```

■ Testing for an empty date when using "02/29" with the CTOD function

```
RETURN !EMPTY(CTOD("02/29/" + year))
```

■ Comparing "02/29/" + year with "03/01/" + year:

```
RETURN CTOD("02/29/" + year) <
    CTOD("03/01/" + year)
```

All of the above methods have limitations. The first one works with most *dBASE* implementations, but it's long. The second is shorter, but it doesn't work with *dBASE III Plus* or *dBASE IV*; the third method doesn't work with *FoxPro* or *Clipper*. I have an alternative—a short way to test for leap years that's also portable across all major *dBASE* dialects. Since every year includes the date "02/28," add 1 to that date. If the result is the 29th, then we have a leap year. The code would look like this:

```
RETURN ;
IIF(DAY(CTOD("02/28/" + ;
STR(year)) + 1) = 29, .T., .F.)
```

Todd N. Troup
Olyphant, Pennsylvania



This method works in *FoxPro*, *Clipper*, *dBASE III Plus* (when converted to a procedure), and *dBASE IV*. It should work in any other *dBASE*-compatible implementation where CTOD() returns something other than its argument for an invalid date.

In *FoxPro* and *Clipper*, if the 29th is not a valid date, CTOD returns an empty date string. In *dBASE III Plus* and *dBASE IV*, if the 29th is not a valid date, CTOD returns 03/01/yy where yy is the year in

question. Either way, extracting DAY() from the result will not equal 29.

On the other hand, if the 29th is a valid date, CTOD dutifully performs the character-to-date conversion and the DAY() function returns 29 in all four products.

While testing this function I discovered an interesting characteristic of *Clipper*. For years in the range 0 through 9999, Mr. Troup's method works correctly in *FoxPro*, *dBASE III Plus*, and *dBASE IV*. *Clipper*, however, stops working for the year 3000 and on. This is consistent with the documentation, which states that *Clipper* supports dates only in the range 01/01/0100 to 12/31/2999.

This means that CTOD() returns an EMPTY date string for any date after 12/31/2999. . . almost. If you use the second method mentioned in Mr. Troup's letter, you'll discover that CTOD("02/29/4000") returns a valid date, as does "02/29" in any other leap year through 9999. In other words, the only time CTOD() returns a valid date in *Clipper* in years past 2999 is for "02/29" in leap years. So if you're using *Clipper* and need

A short way to test for leap years in *dBASE* dialects is to add 1 to the date "2/28." If the result is the 29th, it's a leap year.

to test for leap years in 3000 and beyond, the second method in Mr. Troup's letter is the preferred approach.

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by
Craig Stinson

Spreadsheets

SWITCHING LINKS IN QUATTRO PRO 3.0

I use a system of linked worksheets in *Quattro Pro* 3.0 to analyze my securities portfolio. Often, the program's /Tools|Update Links|Change command comes in handy when I need to switch a set of formulas from one supporting worksheet to another. This allows me to see at a glance any changes that have taken place between, for example, my current worksheet and the one I was most recently working on.

I've run into a serious problem with this command, however. I typically use range names to reference cells in supporting worksheets. If I use the /TUC command to switch the links from one worksheet to another and some of the named cells are not defined on the second worksheet, I expect *Quattro Pro* to scream ERR. Instead, it puts in erroneous values!

Figures 1, 2, and 3 exemplify the problem. In Figure 1, cells B1..B5 of STOCKMAS.WQ1 are linked to cells B1..B5 of STOCKA.WQ1. The formulas reference the supporting cells by name. For example, cell B1 of STOCKA.WQ1 is named GE, so the formula at B1 of STOCKMAS.WQ1 reads +[STOCKA]GE, the formula at cell B2 of STOCKMAS.WQ1 reads +[STOCKA]IBM, and so on.

In Figure 2, I have used the /Tools|Update Links|Change command to make STOCKB.WQ1 the supporting worksheet instead of STOCKA.WQ1. Thus, the formulas in B1..B5 of STOCKMAS.WQ1 now read +[STOCKB]GE, +[STOCKB]IBM, +[STOCKB]LOTS, and so on. Even though STOCKB.WQ1 is laid out a little differently from STOCKA.WQ1 (I've inserted a new row in STOCKB.WQ1), *Quattro Pro* has no trouble redirecting the links to the appropriate addresses in the new supporting worksheet.

But as you can see in Figure 3, a big problem arises when I redirect the links from STOCKB.WQ1 to STOCKC.WQ1. In STOCKC.WQ1, I have deleted the cell named T, so the formula in B5 of

■ SWITCHING LINKS IN QUATTRO PRO 3.0: When you use the /TUC command to switch links, be sure the named cells are defined on the second worksheet. The spreadsheet inserts incorrect answers instead of ERR values.

STOCKMAS.WQ1 is now trying to link to a nonexistent supporting cell. The /TUC command should give me an error message when I try to establish this link, or the result of the attempt should be an ERR (or NA) value at B5 of STOCKMAS.WQ1. Instead, I find that B5 is now linked to the cell named MSFT. *Quattro Pro* has not only given me an erroneous result, but it has also trashed the logic of my master worksheet.

Is this a bug or what?
Anthony Williams
Fredonia, Arizona



The trouble that Mr. Williams is experiencing appears to be an unfortunate side effect of Borland designing its spreadsheets for maximum compatibility with *Lotus 1-2-3*, Release 2.x. As I described in an earlier column (November 27, 1990), all versions of 1-2-3 prior to Release 3 store formula references by address, not by name. Consequently, even though you may enter a formula as, say, @SUM(MAYSALES)*.15, *Lotus 1-2-3* stores the formula as @SUM(H10..H20)*.15 (assuming that the name MAYSALES has been assigned to cells H10..H20).

The program, of course, maintains a table of named ranges, and it consults that table whenever necessary to display your names on the formula line. It also uses the name table to adjust referencing formulas

whenever named cells are relocated as the result of insertions, deletions, or the /Move command.

Quattro Pro appears to behave just like *Lotus 1-2-3*, Release 2.x, in its handling of range names. The formula line in the upper-left quadrant of Figure 1 reads +[STOCKA]GE; however, what's stored in cell B1 of STOCKMAS is actually +[STOCKA]B1.

When Mr. Williams changes the links in STOCKMAS from STOCKA to STOCKB, *Quattro Pro* is smart enough to check the name tables in STOCKA and STOCKB and note that two of the STOCKA's names (MSFT and T) are assigned to different cells in STOCKB. Thus, *Quattro Pro* is able to adjust the contents of cells B4 and B5 so that they still reference MSFT and T in their new locations.

Here's what cells B1 through B5 of STOCKMAS contain, before and after Mr. Williams's first use of the /TUC command:

	Before	After
B1	+ [STOCKA]B1	+ [STOCKB]B1
B2	+ [STOCKA]B2	+ [STOCKB]B2
B3	+ [STOCKA]B3	+ [STOCKB]B3
B4	+ [STOCKA]B4	+ [STOCKB]B5
B5	+ [STOCKA]B5	+ [STOCKB]B6

So far, so good. What happens when the links are shifted to STOCKC?

Again, the adjustment of B1 through B3 is completely straightforward:

	Before	After
B1	+ [STOCKB]B1	+ [STOCKC]B1
B2	+ [STOCKB]B2	+ [STOCKC]B2
B3	+ [STOCKB]B3	+ [STOCKC]B3

In adjusting cell B4, *Quattro Pro* consults the name tables of STOCKB and STOCKC and notes that the name MSFT is assigned to B6 in STOCKC. So the adjustment of this cell is as follows:

Spreadsheets



Figure 1: In this constellation of *Quattro Pro* 3.0 worksheets, STOCKMAS and STOCKA are linked. Figure 2 shows what happens when the links are switched to identically named cells in the STOCKB.WQ1.

	Before	After
B4	+([STOCKB]B5	+([STOCKC]B6

In adjusting cell B5, however, *Quattro Pro* looks for a cell named T in STOCKC and finds none. So it says, in effect, "I won't worry about names, I'll just concern myself with addresses." And it performs the adjustment like this:

	Before	After
B5	+([STOCKB]B6	+([STOCKC]B6

Since addresses, not names, are the basic form in which cells' contents are stored, making this adjustment in this manner is, in the words of a Borland spokesperson, "the most logical course of action." But it makes a mess of Mr. Williams's system of stock-tracking worksheets.

Is it a bug? Yes, but it's a bug with a distinguished pedigree. Had Borland not chosen to emulate both the strengths and defects of 1-2-3, 2.x, so completely, the second /TUC would probably return an error value in cell B5 of STOCKMAS. Incidentally, this is exactly what happens if you retrace Mr. Williams's steps in *Excel*.

The moral of Mr. Williams's tale is to exercise great caution when using /TUC. Judging by the example cited in *Quattro Pro*'s user guide, the command seems to have been designed to handle circumstances in which a supporting worksheet has to be renamed or moved to a different subdirectory. It was probably never intended for cycling formulas between separate supporting sheets. If you do use it to shift a set of formulas from one sheet to another, be sure those sheets are all structured identically. Before your first /TUC, you might want to use the /Editl NameslMake Table command to verify that each worksheet has the same set of names.

HINTS, TIPS, QUESTIONS

Share your latest spreadsheet discovery through *PC Magazine's* Spreadsheets. We'll pay \$50 for any tip we print. Please submit your letter on a disk, together with a printout. Mail your contribution to Spreadsheets, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 10 for access instructions). We regret that we're unable to acknowledge submissions or answer questions individually.

Figure 2: Here, the links have been switched with /TUC to STOCKB.WQ1. Even though STOCKB has a slightly different layout than STOCKA, *Quattro Pro* has no trouble finding the cells in the second worksheet.

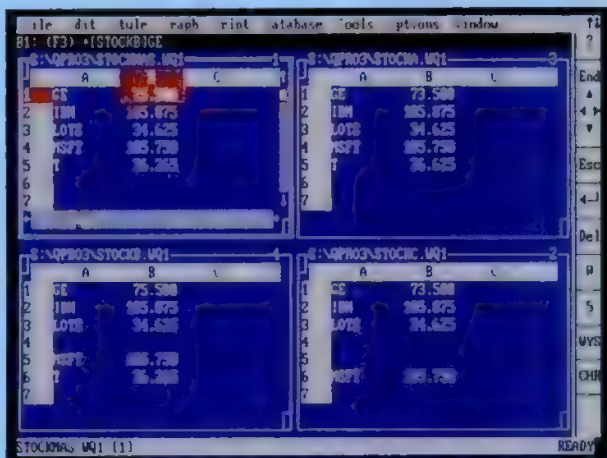


Figure 3: Here the links are switched to STOCKC.WQ1. The MSFT cell has a different location again, but the T cell has been deleted and *Quattro Pro* doesn't return ERR in the appropriate cell on the master worksheet; it returns the wrong answer.



by
Costa Rodis

The Working Word

RETRIEVING NAMED VARIABLES

When defining a macro, you can use the Macro Commands key, Ctrl-PgUp, to assign values, often text, to a variable. While working in a document, you can also use the Macro Commands key to put information into numbered variables from 0 through 9 or into any named variable you choose. The feature is very useful, because it lets you call up the assigned text any time you want.

While macros can access any numbered and named variables, you're limited to retrieving only numbered variables (by holding Alt and tapping a number from 0 to 9) when working in a document. Consequently, if I want to assign more than ten blocks of text to variables or if I want to create an easy-to-remember variable name, I'm stuck.

A short macro provides the solution. Alt-V, shown in Figure 1, lets me easily retrieve any named variable assigned with Ctrl-PgUp. When you execute the macro, it prompts you to enter the name of the variable. Simply type in the name, hit Enter, and the text saved into that variable appears at the current cursor position. Placing this macro into my keyboard layout as Alt-PgUp lets me access the information, while keeping my Alt macro names free for other functions.

Ronald T. Constant
Fort Worth, Texas

PC Variables are a great way to repeat the insertion of many different blocks of text into a document without having to resort to *WordPerfect's* move/copy function. The method is simple. Move the cursor to the beginning of the text you want to assign to a variable. Turn on Block (Alt-F4 or F12) and run the cursor through the text. Hold down the Ctrl key and tap PgUp. At the bottom of the screen, *WordPerfect* displays the prompt Variable:. Type in any number from 0 through 9 and tap Enter. At any point in your document, you can easily retrieve the text. All you have to do is hold

■ **RETRIEVING NAMED VARIABLES:** *WordPerfect* lets you assign text to named variables from document screens, but it won't let you retrieve them. Alt-V resolves this inconsistency.

down Alt and tap the number you used. The text will be inserted at the current cursor position.

As Mr. Constant mentions, *WordPerfect* limits you to only ten numbered variables. So the Alt-V macro comes in quite handy.

This is how the macro works: The {TEXT} command places a message at the bottom of the screen that prompts you for keyboard input. That input is then assigned to the variable VarToInsert. The {VARIABLE} {VARIABLE}~~ command places the contents of VarToInsert at the current cursor position.

As mentioned, you can create a keyboard or a standard *WordPerfect* macro. If you want to make a keyboard macro, follow these steps:

(1) Go into Setup (Shift-F1), select Keyboard Layout (K), and choose Edit (E) with the cursor on the asterisked name. If no name is marked, choose the keyboard layout that best fits your needs. Should no keyboard names be listed, hit Enter and go into Location of Files (L). Enter the path where your macros reside (usually C:\WP51) and exit to the main Setup

menu. Choose Keyboard Layout (K) again, move the cursor to the keyboard layout you prefer, and tap E for Edit.

(2) Select Create (C). The word Key: appears at the bottom of the screen. Hold down Alt and tap PgUp. If your Enhanced keyboard does not respond, you may have to use the PgUp on the numeric keypad or choose another key combination.

(3) The prompt Description: pops up on the bottom of the screen. Type in a description such as "Insert named variable text into document" and tap Enter.

(4) You're now in the macro Action screen. This is where all macro commands (or *actions* in *WordPerfect* parlance) are entered.

(5) Hold down Ctrl and tap PgUp to pop up a menu of macro commands. Move the cursor to {TEXT} and tap Enter. The command appears in the Action screen. Type the following:

```
VarToInsert~Enter name of variable  
to insert into text. > ~
```

and tap Enter.

(6) Hold down the Ctrl key, tap PgUp, and move the cursor to {VARIABLE}. Tap Enter to insert the command into the Action screen.

(7) Repeat step 6 and type **VarToInsert~~**. The whole line should look like this:

```
{VARIABLE} {VARIABLE}VarToInsert~~
```

(8) Tap Exit (F7) two times and then press Enter. This lets you select the keyboard layout with your new macro and exit Setup.

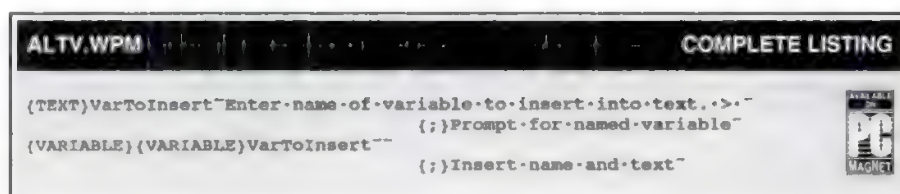


Figure 1: ALTV.WPM lets you retrieve named variables from within a document screen.

Working Word

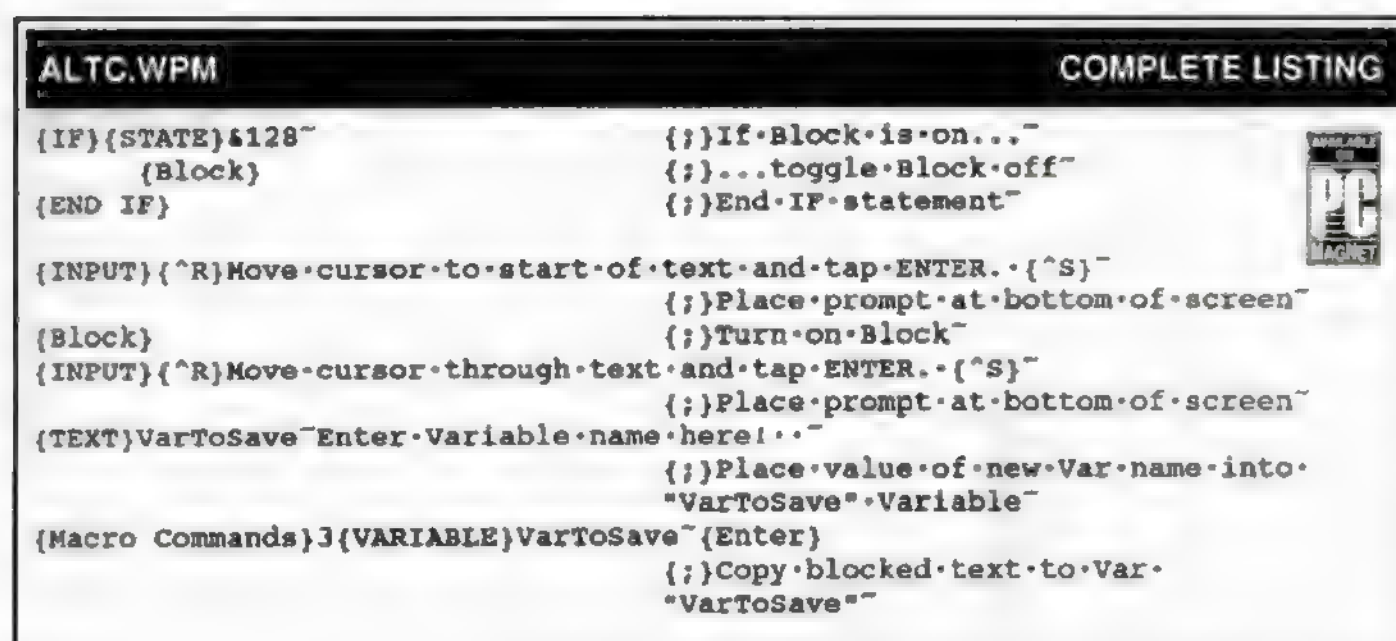


Figure 2: A companion to ALTV.WPM, ALTC.WPM simplifies the task of blocking text and assigning it to a named variable.

Now, to insert a named variable into your document, simply press Alt-PgUp, type in the name of the variable, and press Enter.

If you want to make this a standard *WordPerfect* macro, Alt-V, just follow these steps instead:

(1) Press Home, hold down Ctrl, and tap F10 to Define Macro.

(2) Hold down Alt and tap V to assign the key combination Alt-V to the macro being created.

(3) Type a description, hit Enter, and press Ctrl-F10 once again to turn off the macro recorder.

(4) Press Ctrl-F10 a third time, type in the name of your macro (or press the Alt hotkey combination), and select E for edit.

(5) The macro action screen will pop up, and you should then follow steps 5 through 7 from the instructions for creating a keyboard macro. When you're finished, tap F7 once to exit the macro Action screen.

Hold down Alt and tap V any time you wish to retrieve a named variable into your document.

To make it a bit easier to copy text into a variable, I've created a simple macro, Alt-PgDn or Alt-C, shown in Figure 2. Create it following the steps outlined above for either a keyboard or a standard macro. The actual keystrokes, of course, will be different. Inside the macro Action screen, follow these steps:

Press Ctrl-PgUp to access the Macro Commands menu. Move the cursor to {IF} and tap Enter. Return to the Macro Commands menu again to get {STATE}, then type the ampersand (&) and 128,

followed by a tilde (~). Press Enter to move the cursor to the next line. The line you just typed checks the current state of *WordPerfect* to see if Block is on. Now tap F12 or Alt-F4 to create the Block command. If Block has been on, it will be toggled off. Tap Enter. Return to the Macro Commands menu (Ctrl-PgUp) to get {END IF} and then tap Enter twice. Get {INPUT} from the Macro Commands

**The Alt-C macro
makes it a bit easier
to copy text into
a variable.**

menu, and then press Ctrl-R and type "Move cursor to start of text and tap Enter." Press Ctrl-S and hit the ~ (tilde). Press Block (Alt-F4 or F12) and then go back into the Macro Commands menu to retrieve the {INPUT} command. Press Ctrl-R and type "Move cursor through text and tap Enter." Type Ctrl-S followed by a ~. Pull up {TEXT} from Macro Commands, type "VarToSave~Enter variable name here!"

On the next line, get the {Macro Commands} code by pressing Ctrl-V and then Ctrl-PgUp. Type the number 3. Get {Variable} from Macro Commands, type VarToSave~, and finally press Ctrl-V, followed by Enter to create the {Enter} code.

Keep in mind that variables can hold no more than 129 characters at a time—and that includes codes, spaces, and visible characters.

CORRECTION

A missing tilde (~) in the *WordPerfect* NAVIGATE.WPM macro printed in the May 14, 1991, issue renders the macro useless. Thanks go out to the many readers who caught the error and reported it to us post haste. If you take advantage of PC MagNet, you can download the NAVIGATE.WPM file, which works just as advertised.

Line 21 of code in the macro reads

e~choice5~E~choice5~

It should look like this:

e~choice5~E~choice5~~

Without the second tilde, the macro cannot change directories.

Fewer readers discovered yet another typographical error in the *WordPerfect* ALTS.WPM macro that appeared in the June 11, 1991, issue. Again, although the executable file listed on PC MagNet works, the macro as printed in the magazine is missing a code.

The second line of the macro reads

{ASSIGN}filename~name~~

but it is missing the code {SYSTEM} before **name**. This line should look like this:

{ASSIGN}filename~{SYSTEM}name~~

Unless {SYSTEM} is included, the result of the macro is the creation of a file called NAME while a tilde (~) is placed at the current cursor position. With {SYSTEM} added, the macro properly saves the current document under its current name.

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by
Neil J. Rubenking

User-to-User

DIRECTORY OR FILE?

In a batch file, you can test for the existence of a particular directory with the following line:

```
IF EXIST [path]\NUL [command]
```

To distinguish a directory from a file, combine that line with another IF EXIST statement, like this:

```
IF [not] EXIST [path]\NUL  
[command 1]  
IF [not] EXIST [path] [command 2]
```

For example, if you refer to C:\ABC\FOO, where FOO is a file, then

```
IF EXIST C:\ABC\FOO\NUL
```

will not be true, but

```
IF EXIST C:\ABC\FOO
```

will be true.

As a general rule, you shouldn't use a command that acts directly on a \NUL-appended FOR variable. For example, the line

```
FOR %f IN (C:\ABC\NUL C:\DEF\NUL)  
DO IF EXIST %f COPY XYZ %f
```

won't work the way you want. In such cases, do the tests as separate statements:

```
IF EXIST C:\ABC\NUL COPY XYZ  
C:\ABC
```

However, the FOR statement will work with input variables:

```
FOR %f IN (%1\NUL %2\NUL) DO IF  
EXIST %f COPY XYZ %1
```

Any DOS standard device (such as PRN or CON) can be used to test for the existence of a directory; however, it's a much better idea to get into the habit of

- **DIRECTORY OR FILE?**
This simple test tells whether a pathname is a directory or a file.
- **MOVING FILES:** Here's a faster, safer way to move your files from one directory to another.

using NUL, which won't get you into trouble if you make a weird typo in your batch file.

David Simons
New York, New York



Just in case the usefulness of this tip isn't immediately apparent, I wrote a little batch file called MAKEDIR.BAT, shown in Figure 1. The aim of this batch file is to create a subdirectory off the current directory called NEWDIR. It tests and reports four different situations:

1. Can't create NEWDIR because a file by that name exists.
2. Creates a new directory NEWDIR.
3. Directory NEWDIR already exists and is empty.
4. Directory NEWDIR already exists and contains files.

To test MAKEDIR.BAT, try this. Create a 0-byte file called NEWDIR with the command `REM > NEWDIR` and then run MAKEDIR. It reports that it can't make the directory. Delete the file NEWDIR and run MAKEDIR twice again. The first time, it reports that it's creating the directory; the second time, that it already exists with no files in it. Now copy any file into directory NEWDIR and run MAKEDIR once more. This time it tells you that the directory exists and contains files.

Suppose MAKEDIR were the start of an INSTALL batch file that needs to

create a certain directory. In case 1, it would report the problem to the user and quit. Cases 2 and 3 are effectively the same; you're ready to proceed. In case 4, you might check whether the files in the directory belong to a previous version of the same program you're installing or to a different program. Distinguishing these different cases can be quite handy!

Mr. Simons's cautions that using this technique with the FOR command may be a little confusing. The first FOR example is an attempt to copy the file XYZ into the two directories ABC and DEF if those directories exist. However, the result of that command will actually be to copy file XYZ to the NUL device once for each directory that exists—a pointless action. Yet you can fix that command to work as intended:

```
FOR %f IN (C:\ABC C:\DEF) DO IF  
EXIST %f\NUL COPY XYZ %f
```

The FOR variable gets set first to C:\ABC and then C:\DEF. If the NUL device ex-

MAKEDIR.BAT COMPLETE LISTING

```
@ECHO OFF  
IF EXIST NEWDIR\NUL GOTO Exists  
IF EXIST NEWDIR GOTO IsFile  
ECHO Creating directory NEWDIR.  
MD NEWDIR  
GOTO end  
:IsFile  
ECHO Cannot create directory  
ECHO NEWDIR because a file by  
ECHO that name exists.  
GOTO end  
:Exists  
ECHO The directory NEWDIR  
ECHO exists already.  
IF EXIST NEWDIR\*. * GOTO HasFiles  
ECHO It is empty.  
GOTO end  
:HasFiles  
ECHO It has files in it.  
:end
```

Figure 1: This batch file creates the directory NEWDIR if it doesn't already exist, or reports if the existence of a file called NEWDIR prevents it from creating the directory.

User-to-User

ists in that directory, it's a valid directory and we can copy file XYZ to it safely.

The second FOR loop example is problematic. If either the first or second parameter is the name of an existing directory, it copies a file to the *first* directory. So if the second exists but the first doesn't, this command attempts to copy the file to a nonexistent directory. You don't want to do that!

MOVING FILES

Interrupt 21h function 56h provides a safe way to move files between directories on the same drive. SAFEMOVE.COM, the

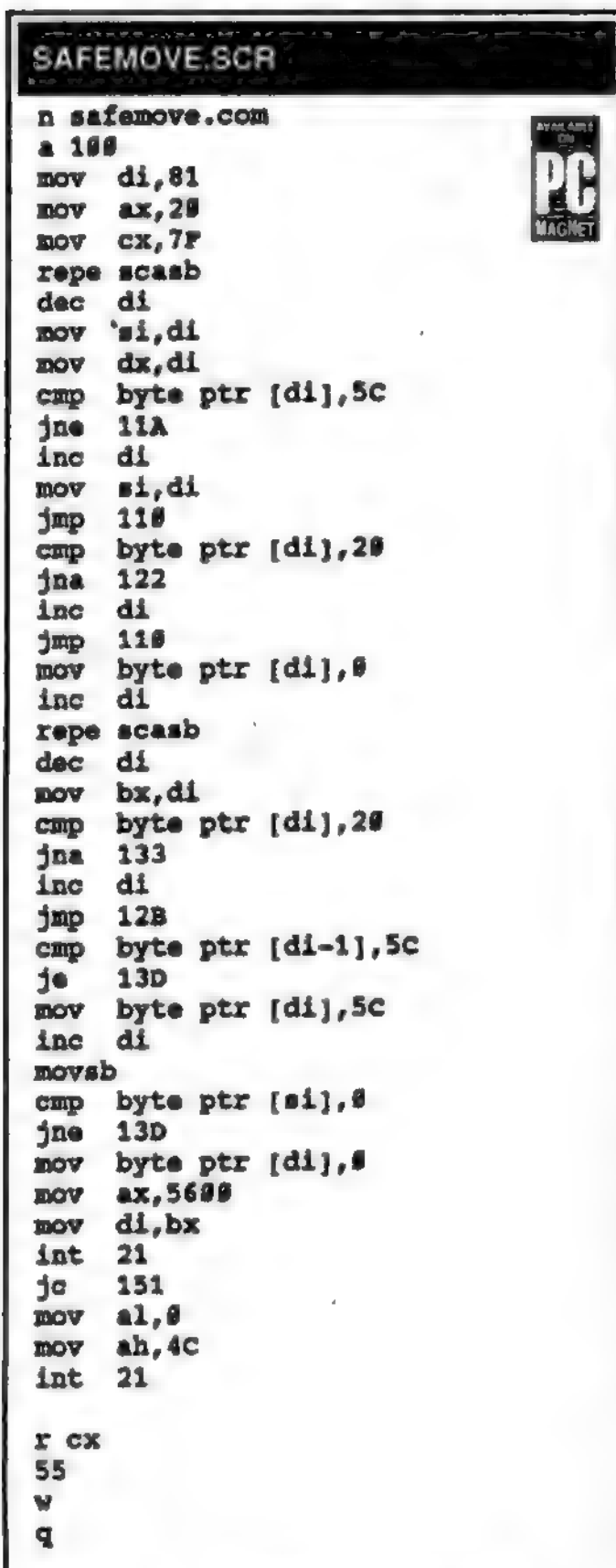


Figure 2: The program created by this DEBUG script safely moves a file from one directory to another on the same drive.

MOVE.BAT and MOV.BAT

COMPLETE LISTING

```
(a) @ECHO OFF
ECHO Moving %1 to %2
SAFEMOVE %1 %2
IF ERRORLEVEL 4 GOTO ERROR
IF ERRORLEVEL 3 GOTO ERROR3
IF ERRORLEVEL 2 GOTO ERROR2
GOTO END
:ERROR
ECHO Error!
GOTO END
:ERROR3
ECHO Path not found!
GOTO END
:ERROR2
ECHO File not found!
:END

(b) @ECHO OFF
ECHO Moving %1 to %2
SAFEMOVE %1 %2
FOR %v IN (1 2 3 4 5 6 17 18) DO IF ERRORLEVEL %v GOTO ERROR%v
GOTO END
:ERROR1
:ERROR4
:ERROR6
:ERROR18
ECHO Unexpected error!
GOTO END
:ERROR2
ECHO File not found!
GOTO END
:ERROR3
ECHO Path not found!
GOTO END
:ERROR5
ECHO Access denied! %1 exists in %2 already!
GOTO END
:ERROR17
ECHO Attempt to rename to different drive!
:END
```

Figure 3: MOVE.BAT (part a) calls SAFEMOVE.COM to move files to another directory, and reports if any errors occurred. Part b is an enhanced version that reports *all* of the common errors that might occur with SAFEMODE.

assembled version of SAFEMOVE.SCR (Figure 2) uses function 56h to move files. To use the program, just type

```
SAFEMOVE oldpath\ filename newpath
```

Use a backslash if you specify a drive as part of *oldpath* when you move a file from the root directory (that is, use C:\filename, not C:filename). You don't have to type *oldpath* if the file you want to move is in the active directory. SAFEMOVE doesn't accept wildcard filenames, but you can create batch files that will use them to make multiple moves. I use CLEANUP.BAT with the command CLEANUP *.BAK, like this:

```
@ECHO OFF
FOR %f IN (%*) DO CALL MOVE %f
\BAK
```

to keep backup files in one directory.

SAFEMOVE.COM is *much* faster than the usual combination of XCOPY and

DELETE. One drawback, though, is that SAFEMOVE won't give you any information about errors. If you want more information about errors, use SAFEMOVE indirectly by calling it from a batch file like MOVE.BAT (Figure 3(a)), which is called by CLEANUP.BAT.

SAFEMOVE.COM fails if

- a file with the new pathname already exists;
- any element of the old pathname does not exist;
- you try to move a file from one drive to another;
- you're moving the file to the root directory and the root directory is full.

Jean S. LaRoche
Beauport, Quebec, Canada



The usual way to move a file from one directory to another is to copy it and then delete the original. Automating this process requires a *lot* of error-checking; you don't want to take the chance of deleting the original until

User-to-User

you're absolutely sure the copy was successful. When you use the DOS internal rename function (DOS function 56h), the file data doesn't get moved at all. That's why it's safe! You can rename the full pathname of a file, and it will look like you've moved it from one directory to another. But actually nothing has changed except the directory entries.

To create SAFEMOVE.COM from the script in Figure 2, give the command

```
DEBUG < SAFEMOVE.SCR >
SAFEMOVE.LOG
```

Now scan SAFEMOVE.LOG and look for any lines that contain '^Error'. If you find any, correct them and try again. Otherwise, SAFEMOVE.COM is ready to use.

Most of SAFEMOVE.COM is devoted to parsing the command line and setting up the registers for the DOS function call. Registers DS:DX must point to the current full pathname, and ES:DI to the new pathname. Once that's been arranged, the program moves 5600h into the AX register and calls INT 21h. If there is any trouble, the carry flag is set and the error number is put in the AL register. If there is no trouble, 0 is put into the AL register. The final call to INT 21h, function 4Ch ends the program with the Errorlevel set to whatever was in AL.

MOVE.BAT reports a couple of the possible errors returned by SAFEMOVE but misses two common ones. Error number 5, Access Denied, usually means that the destination filename already exists. And error number 17 specifically means that you've attempted to rename the file onto a different drive. MOV.BAT (Figure 3(b)) is a modified batch file that specifically reports these two errors.

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edited by
Trudy Neuhaus

Languages

DETECTING ALT KEYSTROKES

I recently wrote an assembly language routine to use with QuickBASIC that indicates if the Alt key was pressed by itself or in conjunction with a regular character key. Detecting either case is not that difficult, but being able to handle both conditions appeared much harder to accomplish. However, I knew it could be done, because the QuickBASIC editor recognizes the Alt key both ways.

The assembly language procedure works in three steps: It revector's the interrupt 9 keyboard handler, tests low memory for the Alt-key bit by reading the scan code directly from the keyboard port, and finally it reinstates the original interrupt vector. While this method appears to work, it seems unduly complex for such a trivial job. Is there a better alternative?

Albert Duro
Brisbane, California



That's a lot of work just to see if Alt is pressed! Since the status of the Alt key (and the Ctrl and Shift keys, too) can be determined by a simple PEEK, this is the method I used in the AltKey% function shown in Figure 1.

This function is meant to be used whenever you would otherwise use BASIC's INKEY\$. However, to make it more efficient, I designed it to return an integer rather than a string. (An integer comparison or assignment creates less

■ **DETECTING ALT KEYSTROKES:** Here's a QuickBASIC function that detects when an Alt-key combination is pressed.

■ **SAVE AND RESTORE COMPILER OPTIONS:** These two Turbo Pascal Include files will help you use various compiler options effectively.

compiled code and executes more quickly than the same operation on a string.) AltKey returns zero if no key has been pressed, a positive number to indicate a regular key's ASCII code, or a negative value if the key pressed was an extended key such as F3 or Ctrl-PgDn.

If you need to test for Ctrl or Shift instead, you can modify this code: Use 4 for the AND value to detect Ctrl, 2 for the Left Shift, or 1 for Right Shift.

AltKey returns to the calling program immediately; this is illustrated in the demonstration by its constantly displaying the time in the upper-left corner of the screen. Because of this "polling" design, it would be simple to modify the code and

have AltKey return a special value to indicate that the Alt key is currently depressed, even though it hasn't yet been acted upon. This is shown in the function as a remark, with the statement AltKey% = 257. Thus, the caller would explicitly test for that value and act on it accordingly, perhaps by highlighting a menu bar, as QuickBASIC does.—Ethan Winer

SAVE AND RESTORE COMPILER OPTIONS

If you have ever tried to use Turbo Pascal's various compiler switches effectively, you know the frustration of guessing when it's necessary to turn the switches off or on. For example, you may want to turn range checking off ({ \$R- }) for Procedure X. But it isn't always appropriate to turn it back on ({ \$R+ }) directly after that procedure. Suppose you decide later that the whole program can run with range checking off. You put { \$R- } at the top of the program, but the { \$R+ } embedded in the code turns range checking *on* again for all the code after Procedure X.

My solution is to save the state of all of the options before changing one, and then restore that state after the code that needs the altered option. The file SAVE-OPTS.INC, which is shown in Figure 2, saves the state of the options by defining a conditional symbol if the option is set. The file RESTOPTS.INC, shown in Figure 3, restores the option based on whether or

ALTKEY% FUNCTION	COMPLETE LISTING
<pre>DECLARE FUNCTION AltKey% () DO K% = AltKey% LOCATE 1, 1 PRINT TIMES LOOP UNTIL K% IF K% > 255 THEN PRINT "Alt was pressed alone" ELSEIF K% < 0 THEN PRINT "Extended code"; -K% ELSE PRINT "You pressed the"; K%; "key" END IF FUNCTION AltKey% STATIC Temp\$ = INKEY\$ SELECT CASE LEN(Temp\$)</pre>	<pre>AltKey% = ASC(Temp\$) CASE 2 AltKey% = -ASC(RIGHT\$(Temp\$, 1)) AltDown% = 0 CASE ELSE AltKey% = 0 OFF DEF% = 0 IF PEEK(\$H40) AND 8 THEN AltDown% = -1 AltKey% = 257 ELSEIF AltDown% THEN AltDown% = 2 AltKey% = 256 END IF OFF DEF% END SELECT END FUNCTION</pre>

Figure 1: This BASIC function and demonstration program shows how to detect the Alt key alone or in conjunction with another key press.

Languages

SAVEOPTS.INC

```
{
$ifdef CSSaved
$error: Can't include this file twice.
{
    Include RestOpts.inc in between
}
$endif
$ifopt B+{$define CSB}{$endif}
$ifopt E+{$define CSE}{$endif}
$ifopt F+{$define CSF}{$endif}
$ifdef VER60
    $ifopt G+{$define CSG}{$endif}
$endif
$ifopt I+{$define CSI}{$endif}
$ifopt R+{$define CSR}{$endif}
$ifopt S+{$define CSS}{$endif}
$ifopt V+{$define CSV}{$endif}
$define CSSaved
}
```

Figure 2: Wherever you \$Include this file in a Turbo Pascal program, it will save the state of all the compiler options.

RESTOPTS.INC

COMPLETE LISTING

```
{
$ifndef CSSaved
$error: Can't include this file without
{
    including SaveOpts.inc first
}
$endif
$ifdef CSB{$B+}{$undef CSB}{$else}{$B-}{$endif}
$ifdef CSF{$F+}{$undef CSF}{$else}{$F-}{$endif}
$ifdef VER60
    $ifdef CSG{$G+}{$undef CSG}{$else}{$G-}{$endif}
$endif
$ifdef CSI{$I+}{$undef CSI}{$else}{$I-}{$endif}
$ifdef CSR{$R+}{$undef CSR}{$else}{$R-}{$endif}
$ifdef CSS{$S+}{$undef CSS}{$else}{$S-}{$endif}
$ifdef CSV{$V+}{$undef CSV}{$else}{$V-}{$endif}
$undef CSSaved
}
```

Figure 3: After you save Turbo Pascal compiler directives with the code in Figure 2, including this file restores their original state.

not the conditional symbol is defined.

To use them, just include them in your program at the appropriate points, using the `{ $I filename }` directive. For example:

```
{ $I SaveOpts.inc }
{ $R-,S- }
... { code that needs the switches
    turned off }
{ $I RestOpts.inc }
```

No matter how the switches were set before, they will be set the same way after restoring them. Note, however, that you cannot nest the saving and restoring; that is, you cannot include SAVEOPTS twice without including RESTOPTS in between. The compiler will let you know by pointing out an error in the Include file. Perhaps a future version of Turbo Pascal will let you restore options to their previous state and properly handle nested changes.

Mark Streich
Westminster, Colorado



The original SAVEOPTS.INC and RESTOPTS.INC attempted to save and restore *every* compiler directive. That's neither necessary nor possible, since the A, D, E, L, N, O, and X directives are global; global directives must only appear before the Program or Unit heading or immediately after it. Still, the stripped-down Include files are useful, and they add no overhead to your final program size.

The Turbo Pascal compiler does have a finite amount of RAM reserved for conditional compilation symbols. If your programs already use several such symbols, the numerous \$DEFINE statements in SAVEOPTS.INC may put you over the edge—you'll get a "Too many conditional symbols" error. I shortened Com-

pilerSwitchB to CSB, so if you get this error you'll have to shorten the names of some *other* symbols.

The \$G option, which controls the generation of 80286-specific code, is new with Version 6.0. By checking the built-in conditional symbol VER60, we determine whether or not to save and restore the \$G switch. As a result, these Include files that will work with any version from 5.0 through 6.0.—Neil J. Rubenking.

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by
Jeff Prosis

Tutor

DISK CACHING VS. MEMORY CACHING

After running a 286 for the past several years, I recently upgraded to a 33-MHz 386 with a 64K RAM cache. On my old machine, I used *PC-Cache*, the caching program that's part of *PC Tools Deluxe*. Should I also use it on my 386, or does the on-board cache do the same thing?

Louis A. Wilmssen
Merksem, Belgium



These caches are two different animals. *PC-Cache* is a disk cache, while the RAM cache on your PC is exactly that—a memory cache. Because RAM caches and disk caches both use the term *cache* in their names, a lot of people become confused. It's natural to assume that they're the same thing, but they're not. A RAM cache is as different from a disk cache as SMARTDrive is from FASTOPEN (take a look at "FAST-OPEN and SMARTDRIVE" in the May 14, 1991, Tutor column and you'll see why I chose this analogy).

PC-Cache (a disk-caching utility similar to SMARTDrive), IBMCACHE.SYS (the disk cache IBM includes with its PS/2 machines), and *PC-Kwik* (one of the most highly rated and popular disk-caching utilities on the market) buffer the data read from the hard disk. They're used purely to make the hard disk appear to run faster. By swapping fast RAM accesses (where the buffered hard disk data is stored) for slower hard disk accesses (which are limited by the mechanical constraints nature imposes on the hardware), a disk cache increases the overall performance of the disk subsystem and therefore increases the perceived speed of the system as a whole.

A RAM cache, on the other hand, speeds up accesses to memory, not to the hard disk. A RAM cache is a hardware device (as opposed to a disk cache, which is implemented entirely in software) that uses fast static RAM to cache data coming from dynamic RAM (DRAM). Static

■ **DISK CACHING VS. MEMORY CACHING:** Two complementary methods for enhancing system performance.

■ **RECLAIMING LOST DISK SPACE:** There's an unused area on your hard disk that you've probably never noticed. Once you find it, you can put it to use.

■ **STEPPING UP:** Like programs, CPU chips sometimes go through several versions in order to eliminate bugs.

RAM typically boasts an access time on the order of 20 nanoseconds. By comparison, even fast DRAMs normally require 80 ns. or more. In a typical scenario, a cache controller monitors all CPU memory reads and interjects data directly from the cache when possible. If data from the requested address doesn't currently reside in the cache, the cache controller fetches it from the main memory subsystem, provides the requested information to the CPU, then copies it to the cache. A well-devised cache can achieve a hit rate (the percentage of time data is delivered from the cache rather than from main memory) of 90 percent or more, decreasing the effective number of wait states imposed on a fast 386 accessing memory to near zero.

One of the most widely used cache controllers is the 32-bit Intel 82385. The 82385 speeds write and read operations using a strategy called *posted writes*. Rather than forcing the CPU to endure wait states when it writes data to main memory, the 82385 accepts the data itself

(at zero wait states) and temporarily buffers it. Then, while the CPU is off doing something else, the 82385 transfers the data to memory. It does other fancy things, too, such as monitoring the system bus to detect when a bus master (the name given to a device that temporarily takes control of the bus from the CPU) updates main memory without involving the CPU. When this happens, the 82385 invalidates any corresponding data in the cache so that bad data won't be passed to the CPU.

Implementing a RAM cache is no trivial feat, and it usually adds a couple hundred dollars to the cost of a PC. But the results you get are generally well worth the expense. The 486 has a built-in cache controller accompanied by an 8K static RAM cache, enabling it to perform most memory accesses at zero wait states without additional hardware.

Should you use both a RAM cache and a disk cache? You bet. In fact, the two will work hand in hand to increase the performance of your system. Each time the hard disk is accessed, your system searches the RAM-based disk cache for data. As the disk cache is searched, the RAM cache speeds up memory accesses, increasing the speed of the search and therefore increasing cache performance. If the data is located in the disk cache, the RAM cache enables the CPU to retrieve it faster. Even if a hard disk access ends up being required, you win, because the RAM cache speeds up the search through the tables that the disk-caching software uses to map the contents of the disk cache.

RECLAIMING LOST DISK SPACE

On every hard disk I've seen, there's a gap of unused disk space between head 0, cylinder 0, sector 1 (where the partition table is stored) and the first sector of the first partition. On my disk, for example, the first partition—a primary DOS partition—starts at head 0, cylinder 3, sector 1. This means there's a gap of three cylinders between the partition table and the disk space that DOS uses. Is this area used for

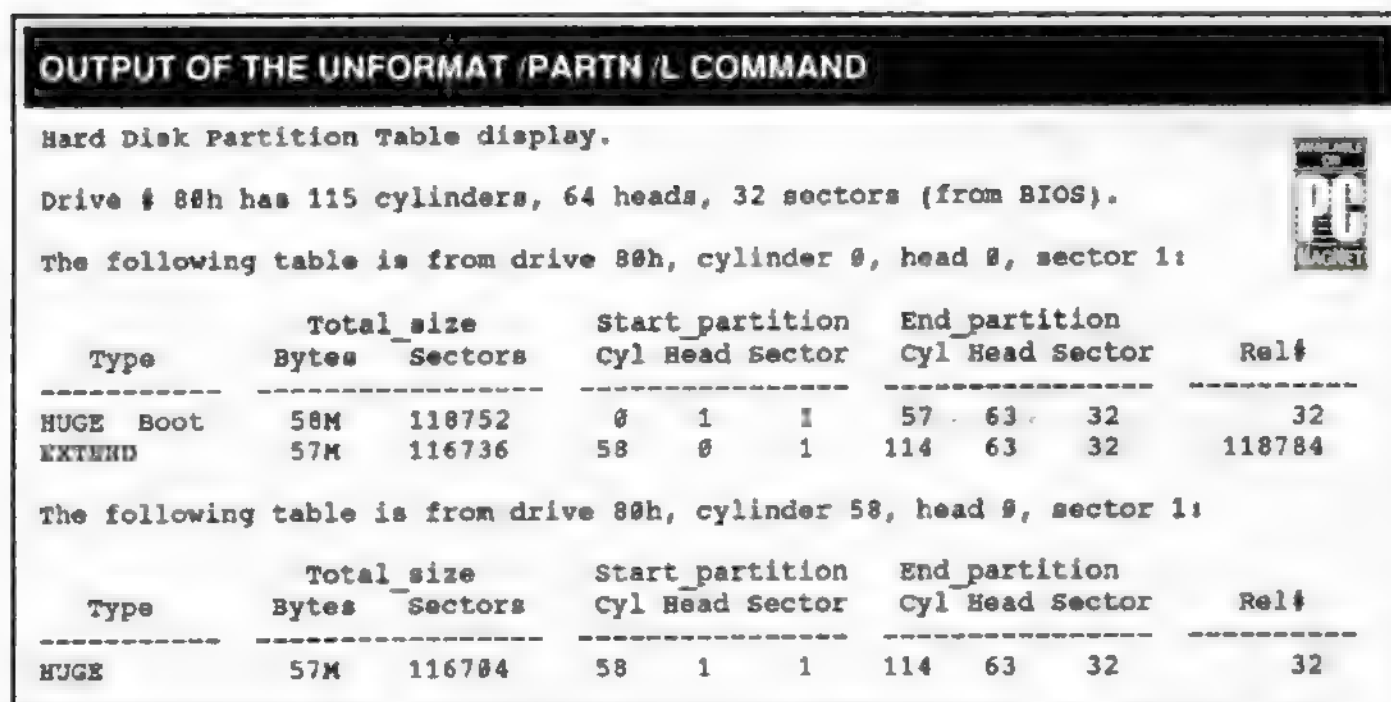


Figure 1: In DOS 5.0, you can use the command `UNFORMAT /PARTN /L` to display the partition information for a hard disk. In this case a 115MB disk is divided into one primary and one extended DOS partition.

anything? Is it free to be used by applications or is there a reason to steer clear of it? I've written data to this area with *The Norton Utilities*, with no adverse effects.

Shaun Pierce

Fort Collins, Colorado

PC MAGAZINE It's up to the utility that partitions a hard disk to decide where the first partition begins. The only guidance DOS provides is a statement in the technical reference indicating that partitions should be allocated in cylinder multiples and should begin on head 0, sector 1. It also says that the first partition may begin at head 0, cylinder 0, sector 2 to account for the partition table in sector 1. In your case, FDISK (the hard-disk-partitioning utility that comes with DOS) evidently chose to skip the first three cylinders altogether and start the primary DOS partition on cylinder 3. This will vary from disk to disk. On my hard disk, for example, the first partition begins at head 1, cylinder 0, sector 1, leaving a gap of only one cylinder between the end of the partition table and the beginning of the primary DOS partition. This is in violation of the sector 1, head 0 rule set forth in the technical reference, but it works anyway, indicating that some room for variance is built in.

DOS doesn't use the dead space between the end of the partition table and the beginning of the first partition. It pretends the space is not even there, refusing to read or write any sectors that lie outside the DOS partitions defined on the disk. I'm not aware of any programs that use

the space, so you're probably safe in writing to it. It's not hard to envision a few uses for this area. For example, a utility that password-protects a hard disk might use the space to store the password and the code that prompts for a password each time the system is booted.

In DOS 5.0, you can easily display the partition information for a hard disk with the command `UNFORMAT /PARTN /L`. Used this way, UNFORMAT doesn't unformat a hard disk. Instead, it displays a listing like the one shown in Figure 1, generated from a 115MB hard disk divided into two DOS partitions, one primary and one extended. If you're curious about what heads, sectors, and cylinders your hard disk partitions begin and end on, use this command to find out.

STEPPING UP

Some of *PC Magazine's* software reviews note that a program requires an 80386 "Step B0 or higher." What does Step B0 mean, and why is it a requirement?

James Rosen

New York, New York

PC MAGAZINE Step numbers for microprocessor chips are like version numbers for software. CPU chips, like programs, sometimes contain bugs (Intel calls them *errata*). A chip manufactured after a bug has been corrected is assigned a higher step number.

The statement "80386 Step B0 or higher required" is common among 80386-specific applications that use 32-bit DOS extenders to gain access to larger

amounts of RAM (*AutoCAD*, Release 11, is one such program). The very first 80386 chips that rolled off the line (A-step chips) could not be switched from protected mode to real mode. DOS extenders usually switch from protected mode to real mode several times in the course of executing a program, so they can't run on A-step 386s. Fortunately, A-step chips were never available commercially, so the chance that you don't have one is pretty good. This bug was corrected in B-step chips, which were first used in the Compaq 386/16, introduced in 1986.

But B-step chips weren't entirely devoid of bugs either. Two bugs—officially known as Erratum #17 and Erratum #21—can cause a B-step 386 to lock up when an 80387 instruction is executed with paging enabled. The first one, Erratum #17, occurs when the first byte of a coprocessor instruction is located in the last byte of a page or segment and the second byte lies in a page or segment that cannot be accessed without triggering a fault. The CPU will hang when it tries to signal the fault.

386 DOS extenders typically employ a software workaround that eliminates Erratum #17 errors. Erratum #21, however, is more troubling. The problem occurs when hardware interrupts empty the prefetch queue during the execution of back-to-back coprocessor instructions.

With paging enabled, if the 386 prefetch unit (the part of the CPU that keeps the instruction prefetch queue filled) requests a memory read at the same time that the 387 requests an operand transfer, the 386 will respond with an incorrect address and leave the 387 in an indeterminate state. Each chip waits for the other to complete an operation, and the system locks. This error doesn't occur if the coprocessor is an 80287 or a Weitek floating-point accelerator.

The only software solution to Erratum #21 is to disable paging. This has profound, undesirable effects on systems running in 32-bit DOS extended environments and on systems running memory managers such as *QEMM-386* and *386MAX*, which use paging to reach into RAM above 1MB from Virtual 86 mode. A better remedy is to replace a B-step chip with a D-step chip, which isn't susceptible to Erratum #21 errors. There are also hardware fixes available for some systems in the form of PAL (programmable array logic) boards and add-on sockets that fit between the 386 and the

Tutor

processor socket on the motherboard; your dealer should be able to recommend one if your system exhibits these problems.

You can tell if you have a B0 or B1 Step level 386 by looking at the markings on the chip. If it has the ID number S40336 or S40337 stamped on it, then it's a Step B0; if it's marked with S40343, S40344, or S40362, it's a Step B1. Some B0 and B1 chips were marked B0 or B1 rather than with an ID number. If your chip is a 386SX or 386DX, then it's not subject to Erratum #17 or #21 errors. Some PC manufacturers knowingly used Step B0 and B1 386s but built logic into their system boards to correct Erratum #21 errors. Thus, there's no need to panic right

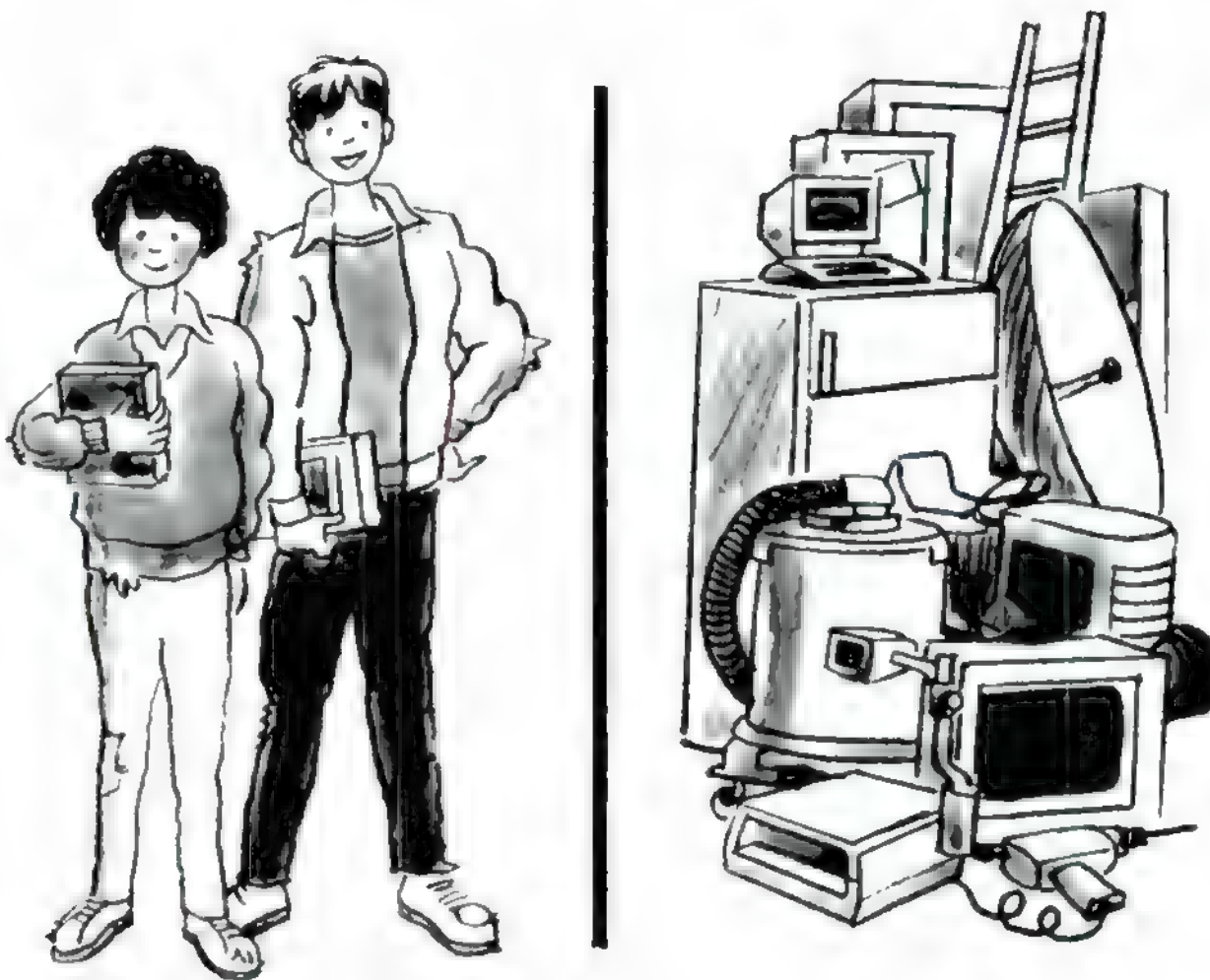
Don't panic if you find that you have a Step B0 or B1 chip; some manufacturers knowingly used them but built logic into their system boards to correct any errors.

away if you find that you have one of these chips. Also, there is a way to detect Step B0 and B1 chips through software. If you're interested, let me know by sending me a message on PC MagNet. If there is sufficient interest, I'll present the code in a future column.

ASK THE TUTOR

The Tutor solves practical problems and explains techniques for using your hardware and software more productively. Questions about DOS and systems in general are answered here. Send your question to Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 10 for instructions). We regret that we're unable to answer questions individually. ■

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From the day of its introduction, UDS' V.32 modem has gathered honors from leading computer publications and other industry watchers!

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For accurate communication over worst-case lines, the unit incorporates V.42 LAP-M and MNP 4 error control functions. A full complement of on-board test functions is included, and eight LEDs provide easy monitoring of the unit's operation and built-in diagnostic features.

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UDS
MOTOROLA

by
Frank J. Derfler, Jr.

Connectivity

CONTROLLING OUT LOUD

I recently saw a product for wireless home automation that I know many readers of the Connectivity column will find interesting.

The Personal Butler, from Mastervoice (213-594-6581), is a voice-activated controller for those X-10 carrier-current-activated power modules you may well have sitting in your closet. These modules—available from Radio Shack, Sears, and outlets such as the Crutchfield catalog (800-336-5566)—accept commands sent over power lines from a central controller to turn appliances on and off and even to dim incandescent lights.

The remote-control modules work, but if you're like me your modules sit unused on a shelf or in a drawer, because the X-10 central controllers are universally so difficult to use. The ones I've tried require a laborious sequence of switch settings and button actions that make programming a VCR seem easy! Then, at the first power interruption of a millisecond or more, they ungracefully forget their programming. Various PC hardware and software packages that control X-10 modules have come and gone, but they're typically menu-controlled and tie up computer resources that should be available for other things.

The Personal Butler is a box about 10 inches tall, 9 inches wide, and 3 inches deep. It looks just like a room intercom, but it raises home automation to a new level. You can hang it on a wall or set it on a table (it needs access to the power line, of course). As many as four people can "train" the unit to recognize a series of voice commands. Because the system is trained for each user, it has the ability to discriminate voices across a long distance. During a demonstration, the product reliably responded to a female voice at a distance of 25 feet across a ballroom full of loud and echoing voices.

You can control as many as 32 X-10 devices by voice. So when you walk into the house with your hands full, you can

- **CONTROLLING OUT LOUD:** A voice-activated controller lets you automate many household tasks.
- **REMOTE PRINTING ON A NETWARE LAN:** A neat way to use Novell's remote-printing utilities.
- **SEARCHING SCANNED DOCUMENTS:** Now you can efficiently search for words in scanned documents.
- **MAKING CELLULAR CONNECTIONS:** Linking a laptop to an office machine via a cellular phone is not so easy.

simply say for instance, "Alexander! Lights! Normal!" Of course, you can give the controller any name you want and make it speak and understand commands in any language. The controller will recognize you by voice, respond with anything you program it to say, and set up the lights in the house to the pattern you have named "normal."

In addition to providing a long series of home control options, the Personal Butler is also a voice-operated telephone ("Alexander! Call Mom! At work!"). It can also act as a burglar alarm.

These Mastervoice controllers aren't cheap. They're available in models ranging between \$3,000 and \$4,000, depending on the features you want, like RS-232 ports, hardware control options, telephone remote-control options, and extensions. But that's about the price of a Jacuzzi bathtub, something many people have in their homes and never use. The Personal

Butler is a lot more practical.

Voice synthesis and voice recognition technologies aren't exotic. They simply require a lot of fast memory and processing capability. The Mastervoice system gets high marks for providing nice-sounding voice synthesis and excellent voice recognition capabilities. As the prices for both memory and processors continue to drop, we should see many practical voice recognition and voice synthesis devices unveiled for the PC, perhaps including X-10 controllers operating as multi-tasked applications.

REMOTE PRINTING ON A NETWARE LAN

In your May 14, 1991, Connectivity column, reader Keith Mueller wrote concerning sharing network printers under NetWare 3.1, using the IF P_STATION command and RPRINTER workstation printing option. The RPRINTER facility is perhaps the single most useful tool to come out of Provo since NetWare/286.

There is, however, a simpler, more elegant method of initializing remote printers, and you can use it on any workstation with 85K of local disk storage available. All you have to do is copy the RPRINTER files (RPRINTER.EXE, RPRINT\$.EXE, RPRINTER.HLP) to the local drive and then add the RPRINTER command line to the workstation's AUTOEXEC.BAT file after the lines that load IPX.COM and NETX.COM files.

This operation requires no additional user name or login script administration and the workstation doesn't have to be logged on to the file server, since RPRINTER uses the IPX layer of the network operating system to broadcast its availability to the print server and to receive print jobs. Any administrator can quickly find that station's print server name and configuration number by typing out its AUTOEXEC.BAT file. This is a more secure connection method, because unattended stations don't have to be logged in. This completely automatic method of at-

Connectivity

taching remote printers works on all Novell *NetWare* LANs using the PSERVER utility (NLM, VAP, or dedicated).

Just thought I might share this idea, since I've received so many ideas and helpful hints through this column. Keep up the good work!

Steve Wike

Jackson, California



PSERVER.NLM loads a print server on the file server, while PSERVER.EXE dedicates a workstation as a print server. RPRINTER.EXE is a TSR program that lets network users share workstation printers, without intervention from a user at the workstation. Placing RPRINTER in the workstation's AUTOEXEC.BAT file automatically sets up the workstation for remote printing at boot-up.

Mr. Wike's hint is one of the neatest I've ever received, because it's so simple. You can easily set up *NetWare* remote-printing services on any PC that has IPX loaded—even if it isn't logged onto the file server. Those of us who work with *NetWare* every day tend to become so server-oriented that we forget the value of distributed network communications.

SEARCHING SCANNED DOCUMENTS

We move a lot of mail in our law office. A *NetWare* 2.15 file server controls our six-node network, and we use document management software to store and index the files we create. We scan in the paper documents we receive, but it takes someone with a strong knowledge of a specific subject to create the index words for a scanned document. Is there any way to search a scanned-in document for a specific word?

Bill George

Chicago, Illinois



Word-search software can't work on a scanned image, so a knowledgeable person must carefully pick the words used to index the image in the document database. When this isn't done correctly, important documents can become disassociated from the database.

I found one company, though, with an answer to the question of how to perform word searches in scanned documents:

Compulink Management Center (213-212-6820).

Compulink applies optical character reader (OCR) software to the scanned image to turn it into an ASCII file. The OCR software can't handle handwritten messages or scribbled marginal notes, but it can create ASCII text from the scanned image of documents printed in a variety of fonts used in business. Then, after you find a document through a word search, you can view the ASCII version and the scanned image side by side on the screen to see if there are any notations the OCR missed.

You can easily set up
NetWare remote-
printing services on
any PC that has IPX
loaded—even if it isn't
logged on to the file
server.

Compulink's *LaserFiche LAN* software indexes every word in all documents, and the searches are very fast. The software can also import and index documents in a variety of formats generated by different word-processing programs. It is designed to run under *NetWare* and to give all client PCs flexible access to stored documents. A *LaserFiche LAN* starter kit that can serve up to 20 users is priced at \$7,995.

MAKING CELLULAR CONNECTIONS

I increasingly find myself with a need to link my laptop computer to my office from my car. I can talk to the office from my car's cellular phone, but how can I hook my laptop's modem to the phone? There's no RJ-11 jack.

Fred Winston

Santa Monica, California



Connecting a modem to a cellular phone is no easy task. You can purchase a phone that has its own RJ-11 jack (particularly some Motorola

models), but you still must dial the number from the handset. Similarly, most of the add-in devices that fit between the handset and the body of the phone don't accept dialing tones from the modem; they require manual dialing from the handset.

You can also buy add-in devices that offer auto-dial and auto-answer capabilities, allowing your communications software to dial the remote computer. These devices, based on a patent held by Telular Corp. of Wilmette, Illinois, cost around \$400. The products aren't easy to install because of their need for a separate power supply, but they do work well.

One of the most practical implementations of an external jack without dialing capabilities comes from Zirco in Wheat Ridge, Colorado (303-421-2013). The Zirco DataCell is simple to use: You plug your modem's RJ-11 cable into the RJ-11 jack on the DataCell and insert the DataCell between the cellular phone's handset and the telephone itself. The DataCell uses the power from the cellular phone.

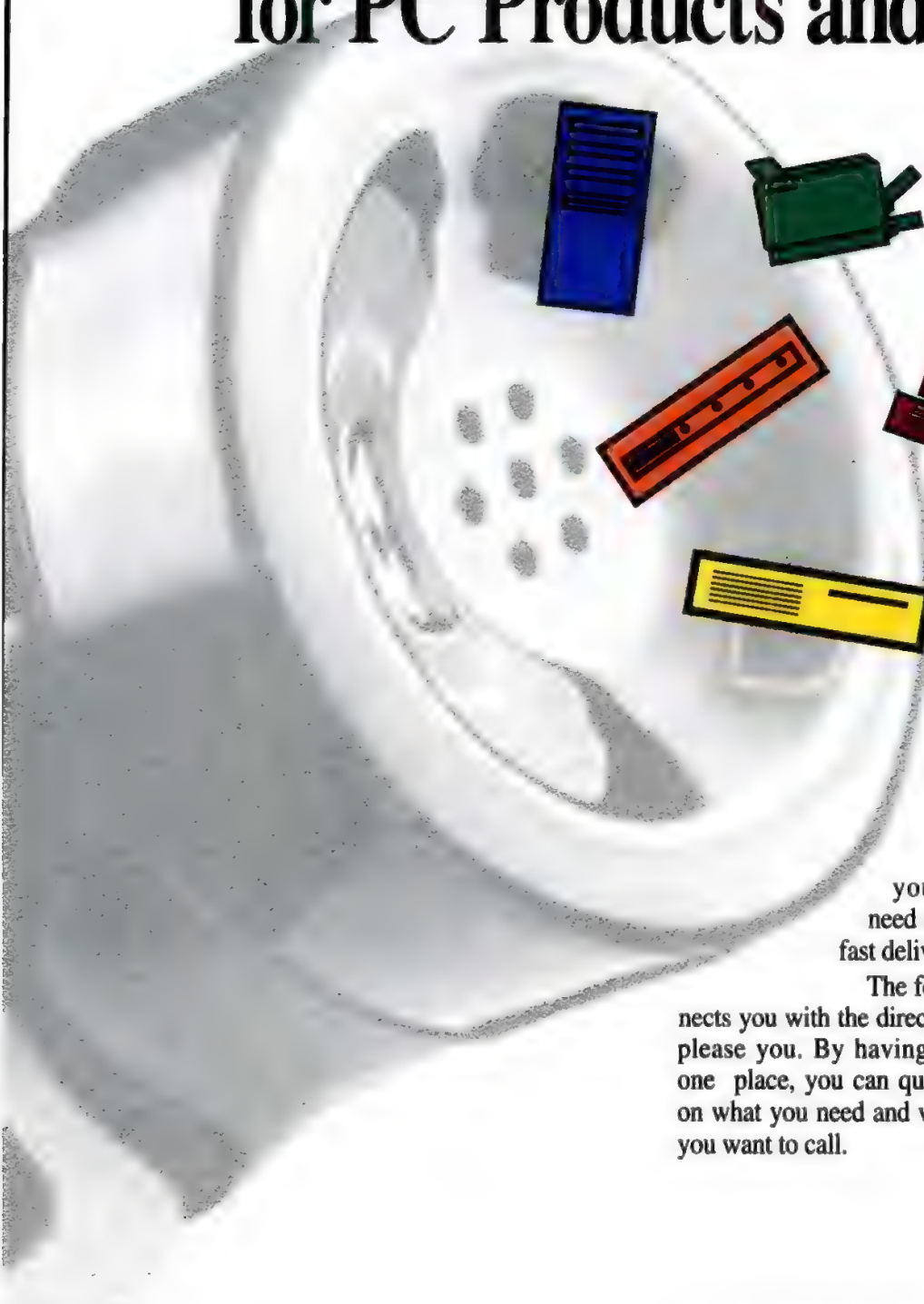
You'll need to order an external data jack device for the specific cellular phone you want to use. The plugs and cords are different for almost every model. At last count, you could order a DataCell to match one of more than 200 models of cellular telephones. We've had better luck exchanging facsimile messages over cellular telephone connections than trying to push data through a modem. It's too easy to overlook problems that frustrate perfectionist data systems.

Zirco also markets the PowerTrip, a very nice adapter that provides 110 volts of AC power at 100 watts from your 12-volt cigarette-lighter jack, enough power to run some fax machines, many laptops, and all battery chargers. Those of you who reside outside the U.S. can obtain PowerTrips in many voltage and socket configurations.

NETWORK YOUR QUESTIONS

Connectivity gives you practical solutions to networking problems of all types. We'll pay \$50 for any tip we print. Please submit your letter on a disk along with a printout. Mail your contribution to Connectivity, *PC Magazine*, One Park Avenue, New York, NY 10016, or you may contact Frank J. Derfler, Jr., via MCI Mail (the ID number is 3103182). We regret that we are unable to acknowledge submissions or answer letters individually. ■

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VGA 1024ml	\$1,929	\$1,999	\$2,249	\$3,599



FastData 386/25 \$1699

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386/DX25	80mb	100mb	200mb	660mb
Mono	\$1,399	\$1,469	\$1,719	\$3,069
Mono VGA	\$1,499	\$1,569	\$1,819	\$3,169
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- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor with 16 bit VGA card with 512K.
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- ✓ FCC Class B approved.

386/SX20	40mb	80mb	100mb	200mb
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- ✓ 200 watt power supply
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- ✓ Clock calendar, parallel port, two serial ports, and a game port.
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots, 5 drive bays.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add \$69.
- ✓ MS-DOS 5.0.
- ✓ FCC Class B approved.

386/SX16	40mb	80mb	100mb	200mb
Mono	\$999	\$1,129	\$1,199	\$1,449
Mono VGA	\$1,099	\$1,229	\$1,299	\$1,549
VGA Color	\$1,249	\$1,379	\$1,449	\$1,699
VGA 1024i	\$1,299	\$1,429	\$1,499	\$1,749

FASTMICRO

For information or to order call:
1-800-441-FAST

DISK DRIVES

CD-ROM

Hitachi Ext. 680mb Kit.....	499
Sony Int. 680mb Kit.....	379
Book of Mammals / Encyclopedia.....	49/69
MS Bookshelf, Stat. Pack.....	
World Atlas & Consultant CDs.....	99

Colorado

DJ-10 40-120mb Int. Tape.....	239
DJ-20 80-240mb Int. Tape.....	299
External Kit.....	69

Toshiba 100mb IDE Kit

\$369

Upgrade your 286 or 386 to IDE technology and Toshiba quality at a FastMicro price. This kit comes with a fast 20ms 100mb drive and built-in 1:1 controller, 16 bit IDE card with dual floppy controller & cables, 5.25" brackets & rails.

Conner (see FastData IDE controllers)
 CP3044 40mb IDE 28ms.....199
 CP3104 100mb IDE 25ms.....349
 CP3208 200mb IDE 25ms.....599

DTC
 6280 ESDI 16bit HD/FD Cont.....119
 6280-15T 15mbit/sec transfer rate.....169

Micropolis (see DTC Controllers)
 MC1664 345mb HH ESDI 14ms.....1099
 MC1568 668mb FH ESDI 14ms.....1499
 MC1518 1.3gb FH ESDI 14ms.....2595

Plus Development
 HardCard IXL 50mb 9 ms 16bit.....399
 HardCard IXL 105mb 9 ms 16bit.....579



Seagate 89mb AT Kit \$319

IDE performance, big 89 megabyte capacity, 19ms access time and 5 mbps transfer rate make this a great buy. Controller, cables and rails are included to make installation fast and easy.

Seagate	
30MB XT Kit ST238 w/ cont.....	249
40MB AT ST251-1 MFM Drive.....	229
40MB AT ST157A 28ms IDE Drive.....	179
125MB ST1102A 19ms IDE Drive.....	299
125MB ST1144A 19ms IDE Drive.....	359
210MB ST1239A 15ms IDE Drive.....	599
330MB ST2383E 16ms ESDI Drive.....	1199
Teac	
1.2MB 5.25" Floppy.....	65
1.44MB 3.5" Floppy.....	65



Toshiba 1.44mb Floppy \$59

Complete with mounting brackets and installation instructions, this Toshiba works in all true 286 & 386 compatibles. Will also read/write/format 720K 3.5" disks. Rails, add \$5

Toshiba	
360K 5.25" Floppy (Black).....	59
1.2MB 5.25" Floppy.....	59
1.44MB 3.5" Floppy.....	59
100mb MK234FCH IDE 3.5" drive.....	349
Western Digital	
WD93044 40mb IDE 28ms.....	199
WDAC280 80mb IDE 20ms.....	299
WDAP4200 200mb IDE 20ms.....	649

MODEMS & FAX

ATI	
2400 ETC Internal / External.....	129/159
8514/Ultra+VGA 1mb.....	599
9600/E External MNP V.42bis.....	369



ATI \$369 9600ETC-E

ATI delivers speed and accuracy with the 9600 Etc-E. It includes V.42, L.A.P.M., and MNP error correction combined with MNP/V.42 bis data compression to provide total high speed throughput. It features automatic line speed correction, synchronous/asynchronous communication and automatic feature negotiation with connecting with other modems.

Everex 2400B Int Modem.....69

Hayes	
JT FAX 4800B Internal.....	139
Personal Modem 2400 w/Prody.....	119
Pocket Edition 2400 Modem.....	119

Intel
 Classic 2400 Modem Int./Ext.....139/169
 Satisfaction Classic - Int 9600.....379



OmniLink Laser \$379

Don't settle for curled-up thermal paper or tie up your PC to receive faxes - get OmniLink Laser. It connects to your phone line and HP compatible laser and receives and prints your faxes. You can still print anytime you want and OmniLink will store up to 30 faxes while your printing. Plus, it's a 2400/9600 modem/hand & receive fax (Requires Software - \$85).

Practical Peripherals	
2400B Int Modem.....	125
2400B Int with MNP.....	159
PM9600SA Ext. V.32/V.42bis.....	449

USRobotics
 2400 Sportster Int / Ext.....119/135
 2400 Sportster MNP Int / Ext.....159/189
 Courier HST 14,400 Int / Ext.....539/579
 Courier HST 14,400 Dual Std Ext.....839

ZOOM	
HC2400 Internal.....	69
2400 V.42bis External Modem.....	159
9624 Send/Receive Int Fax Modem.....	119

MICE & INPUT

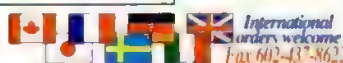
Key Tronic 101 Keyboard.....	59
Professional Mouse.....	59
Logitech	
Mouseman Serial nighthand.....	65
Mouseman Serial with Windows.....	127
Mouseman Bus nighthand.....	76
Mouseman Cordless.....	129
ScanMan 32.....	165
ScanMan 32 with Catchword.....	199
ScanMan 256 for Windows.....	279
Trackman Serial.....	75



Microsoft Mouse \$83

Ergonomic design and 400 DPI accuracy make this the world's most popular mouse. Microsoft design and mouse utilities assure compatibility with the programs you use most.

Microsoft	
Serial or Bus Mouse only.....	83
Serial or Bus with paint.....	95
Serial with Windows.....	147
Z-Nix Super Mouse II w/Windows.....	79



NETWORKING

Artisoft/Lantastic	
Lantastic Two Station Starter Kit:	
2 Mbps.....	349
Ethernet.....	499
Lantastic Additional Stations:	
2mbps.....	139
Ethernet.....	209

FASTDATA PRODUCTS



FastData 16 Bit VGA \$69 \$89

The FastData 16 bit VGA card features 256K of video memory, does CGA, EGA, & VGA up to 1024x768 and comes with drivers for popular software including Windows 3.0. It's expandable to 512K and has a 30 day money-back guarantee.

FastData 16bit 1mb VGA.....	99
FastData CGA Card.....	35
FastData MGP Card.....	29

FastData Monitors



Your best value, guaranteed! We have a full line manufactured for us by manufacturers like Hyundai and Matsushita (Panasonic). As with all FastData branded product, you get a full 30-day money back satisfaction guarantee. Shown is the VGA color.

VIDEO & MONITORS

ATI	
VGA Basic 16.....	75
VGA Wonder + 256K / 512K.....	159/189
VGA Wonder XL 256K / 1mb.....	189/259
8514 Ultra 8514+VGA 1mb.....	599
Diamond	
SpeedStar 512K.....	179
SpeedStar Plus 1mb.....	259
Everex EGA 480 Card.....	69
FastData Monitors & Cards.....	see above
Hercules Graphic Card +.....	Call
Mitsubishi	
1410 EGA.....	325
Diamond Scan 1381.....	499
Diamond Scan 16L.....	919
NEC	
Multisync GS 2a.....	199
Multisync 3ds.....	589
Multisync 4ds.....	949
Orchid ProDesigner II 1mb.....	279
Paradise	
Basic VGA - 8 bit.....	99
VGA 1024 256K/512K.....	149/179
Panasonic C1381 VGA.....	369
Seiko	
CM1440.....	499
CM1450.....	639
Sony 1304 Multiscan.....	629
Video 7	
VGA 1024 256K / 512K.....	129/149
V-RAM II VGA 512K / 1mb.....	249/319
Zenith 1492.....	599

BOARDS & CHIPS

Brown Wagh	
Sound Blaster.....	149
Sound Blaster Pro (stereo & MIDI).....	189
Everex	
RAM3000 16 bit - w/ OK (max 3mb).....	75
RAM3000 16 bit - w/ 1mb.....	135
RAM8000 16 bit - w/ OK (max 8 mb).....	169
RAM8000 16 bit - w/ 2mb.....	289
Intel	
287XL.....	85
387-DX25 or 33.....	209
387-SX16 / 20.....	129/139
Memory - 1mb SIMMS 80ns.....	559
Memory - 1mb chips 80ns set of 9.....	559

9600B SendFax w/ 2400B Modem.....	99
9600B Send/Receive Fax w/2400B.....	119
IDE 16 Bit 1:1 Hard/Floppy Disk Cont.....	29
IDE HD/FD w/Par/2 Senal/Game.....	39
Parallel/2 Senal/Game Card.....	29
RL 16bit 1:1 Hard/Floppy Disk Cont.....	59
XT 1.44 Dual Floppy Controller.....	35

FastData 2400 Baud Modem \$59

The FastData 2400 baud internal modem is fully Hayes compatible and can be configured to COM port 1-4. It has an internal speaker, is auto answer & auto dial, and comes with communications software.

FastData Monitors	
14" Amber or White Monochrome.....	99
14" White VGA Monochrome.....	119
14" CGA Color .52 dot pitch.....	199
14" VGA Color .31 dot pitch.....	279
14" Super VGA 1024 x 768 28 dp.....	319
14" Non-Int VGA 1024 x 768 28 dp.....	429



Sound Blaster \$149

Sound Blaster does for sound what VGA does for graphics! Supported by the largest software library, Sound Blaster make your games come to life. Also includes a music synthesizer, voice input and sound compression, and MIDI interface. SB Talker even converts text into spoken English. Includes a game port also.

PRINTERS

Canon	
BJ10E Portable.....	319
BJ300 / BJ330 Ink Jet.....	459/599
LBP-4 Laser.....	799
Citizen	
200GX 9 Pin.....	189
GSX-130 24 Pin.....	249
GSX140-24 Pin.....	295
GSX145 24 Pin Wide.....	395
PN48 Std / Pro.....	299/329
Fujitsu DL3400.....	359
NEC	
P3200 24 Pin.....	269
P3300 24 Pin Wide.....	369
P6200 / 6300.....	469/629
Silentwriter 2 Model 90.....	1550
Okidata	
Okilaser 400.....	669
Panasonic	
KXP1180 9 Pin.....	155
KXP1123 24 Pin.....	239
KXP1124 24 Pin.....	289
KXP1624 24 Pin Wide.....	369
KXP2624 24 Pin Quiet.....	459
KXP4420 Laser.....	899
KXP4450 / 4455 Lasers.....	1299/Call
Seiko Smart Label Printer Plus.....	167
Star	
NX1001.....	149
NX2410 / 2415.....	239/369
XB2410 / 2415.....	419/539

Texas Instruments

MicroLaser PS17	\$1199
PostScript laser printing has never been so affordable. The TI PS17 includes 15mb of memory, PostScript by Adobe, and 17 standard fonts including Times, Helvetica, Courier and Symbol. It handles paper up to 8.5 x 14 and envelopes too!	
Texas Instruments	
MicroLaser PS17.....	1199
MicroLaser PS35.....	1499



FastData 286/12 \$699

Imagine a fast 286 computer at a super price and you've got the FastData 286/12. This system is complete, not stripped. You get one megabyte of zero-wait-state memory and a 28ms IDE hard disk - standard. Also included is an amber monitor and graphics card, your choice of a high density 1.2mb or 1.44mb floppy drive and a KeyTronic keyboard. And since it's a FastData, you are backed with toll-free technical support, one year warranty with the FastShip replacement program & on-site service plan, and our 30 day full money back satisfaction guarantee!

- ✓ 12mhz 80286 processor.
- ✓ 1 megabyte RAM.
- ✓ 40 mb 28ms IDE hard disk 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive (2nd drive add \$59)
- ✓ Standard chassis (shown)
- ✓ Five drive bays.
- ✓ 200 watt power supply.
- ✓ Math coprocessor socket
- ✓ Monochrome monitor with monochrome graphic board.
- ✓ Clock calendar, parallel port, game port, & 2 serial ports.
- ✓ KeyTronic enhanced 101 keyboard.
- ✓ 8 expansion slots, 6 available.
- ✓ MS-DOS 5.0.
- ✓ Full documentation.
- ✓ FCC Class B approved.



	286/12	40mb	80mb	100mb	200mb
Monoc		\$699	\$829	\$899	\$1,149
Monoc VGA		\$799	\$929	\$999	\$1,249
VGA Color		\$949	\$1,079	\$1,149	\$1,399
VGA 1624		\$999	\$1,129	\$1,199	\$1,449

DATABASE & FORMS

askSam 5.0.....	209
Clarion Personal Developer.....	45
Clarion Professional Developer.....	449
Clipper 5.01.....	489
DataEase.....	509
dBase III+.....	439
dBase IV.....	479
dBXL Diamond.....	129
Formbase.....	299
FormTool Gold.....	52
Formfiller.....	85
Foxbase Plus.....	179
FoxPro 2.0.....	449
Paradox 3.5.....	489
Paradox Competitive Upgrade.....	169
Per:Form Designer & Filler.....	89
Personal Rbase.....	79
Q & A 4.0.....	249
RapidFile.....	99
Rbase for DOS.....	447
Reflex.....	159

Personal

R:Base \$79

Who says powerful relational databases are expensive? Not with Personal R:Base. It has intuitive pull-down menus that let you query your data, build quick forms and reports automatically and even build applications without complex programming. You can import from and export data to other formats and even dynamically read and write dBase files.



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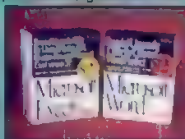
Adobe Postscript Cart. for HPLJ-II.....	299
Bannermania.....	21
db Publisher Professional.....	389
Express Publisher.....	Call
Pagemaker 4.0.....	489
PFS:First Publisher.....	89
Printshop.....	33
Publisher's Paintbrush.....	279
Publish III.....	129
Ventura Publisher Gold / Windows.....	519

WINDOWS SOFTWARE

3-D Charts to Go for Windows.....	55
ACCPAC Simply Acctg for Windows.....	119
Adobe Illustrator.....	309
Adobe Streamline.....	119
Adobe Type Sets.....	Call
Adobe Type Align.....	59
Adobe Type Manager.....	59
Adobe Type Manager Plus Pack.....	115
After Dark for Windows.....	25
Ami.....	115
Ami Pro 2.0.....	287
Ami Pro 2.0 Competitive Upgrade.....	119

\$129^{ea}

1-2-3 or WordPerfect users can upgrade to Excel or Word for Windows for just \$129. Excel is the top rated graphical spreadsheet with 3-D charting, linking, new T:olBar and more. Word for Windows just won PC World's best buy. To register your upgrade, you must state that you owned 1-2-3, WordPerfect or one of 11 other qualifying products.



Asymetrix Toolbook.....	279
BeckerTools Plus.....	Call
Bitstream Facelit.....	57
Corel Draw 2.0.....	359
Correct Grammar.....	57
Current.....	Call
DBfast/Windows.....	239
DynaComm 3.0 Async.....	139
Excel.....	299
Facelit.....	57
Form Publisher.....	139
Grammatik IV for Windows.....	55
HDC First Apps or Windows Express.....	55

PageMaker 4.0 \$489

The top desktop publishing software for Windows just got better. Version 4.0 adds story editor, a built-in word processor and spell checker. PageMaker's advanced text manipulation and color design tools give you the professional look. New Table Editor lets you create dynamically linked tables and graphics can flow automatically with text. Also includes Adobe Type Manager for Windows.

Instant Ordchart!.....	119
JustWrite.....	129
Lotus 1-2-3 for Windows.....	Call
Lotus 1-2-3 Competitive Upgrade.....	119

FINANCIAL

ACCPAC BPI Value Pak.....	359
ACCPAC Simply Acctg for Windows.....	119
Bedford Integrated Acct.....	119
DAC Accounting 4.1.....	79
DAC Bonus Pack 4.1.....	119

Managing Your Money \$115

Andrew Tobias Managing Your Money is the one personal financial manager that does it all! It writes and prints checks, organizes and tracks income and expenses, manages payables and receivables, prints invoices, organizes and estimates taxes, analyzes insurance needs, tracks and amortizes loans, manages your stock portfolio and more. Plus, it includes an electronic rolodex & appointment schedule and can export data to 1-2-3 and tax prep programs.



Dollars & Sense.....	55
Managing Your Money Money Matters.....	115
One Write Plus G/L, A/P & A/R.....	49
Pacioli 2000.....	165
Peachtree Crystal Acctg for Wind.....	35
Peachtree Complete III.....	139
Peachtree with Data Query.....	209
Quicken.....	36
The Manager's Organizer.....	139
Timeslips III.....	179
Wealth Builder.....	95

ENTERTAINMENT

Carmen SanDiego Deluxe Edition.....	45
F-19 Stealth Fighter.....	38
Hunt for Red October.....	19
King's Quest 5 (VGA Vers).....	38
Leisure Suit Larry II or III.....	35
Microsoft Flight Simulator.....	38
Aircraft & Scenery Designer.....	38
PC Globe or PC USA.....	35
Simcity.....	28
SimEarth.....	39
Wing Commander I / II.....	39 / 45

Windows 3.0 \$89

Get in on the Windows revolution! Windows turns your 286 or above into a powerful multitasking workstation that runs even non Windows applications. Includes many integrated applications standard. Plus, if you buy Windows from FastMicro, we'll throw in 12 of the best Windows shareware programs free!

Micrographix Draw +.....	149
Micrographix Designer.....	449
MicroPhone II.....	199
Microsoft Entertainment Pack.....	27
Microsoft Mouse w/ Windows 3.0.....	147
Microsoft Office (Word/Excel/Powerpoint).....	447
Microsoft Powerpoint for Windows.....	309
Microsoft Productivity Pack.....	39
Microsoft Windows Developer's Kit.....	309
Microsoft Word for Windows.....	299
M Y O B.....	129
Norton Backup.....	85
Norton Desktop.....	95
ObjectVision for Windows.....	89
On Target.....	259

Visual Basic \$125

You've heard about it, now you can take advantage of this powerful and easy to use development system for Windows. Microsoft's Visual Basic contains a palette of visual tools to design and develop true Windows applications. It includes an interpreter to run your applications as you develop them and a compiler to turn them into royalty-free EXE files. Also includes debugging tools and sample applications you can modify.

PackRat 3.0.....	239
Pagemaker 4.0.....	489
Persuasion.....	319
Per Form Pro.....	149
PFS WindowsWorks.....	119
Pro Write Plus.....	165
Project for Windows.....	429
Publisher's Powerpak.....	45
Publisher's Paintbrush.....	279
RightWriter for Windows.....	Call
SuperBase 4.....	419
Turbo Pascal for Windows.....	Call
Ventura Publisher.....	519
WideAngle for Windows.....	62
Winconnect.....	59
Windows 3.0.....	89
WinFax Pro.....	69



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Autosketch 3.0.....	139
Corel Draw 2.0.....	359
Design CADD 3-D.....	185
DrawPerfect.....	259
Freelance Graphics 4.0.....	299
Freelance Competitive Upgrade.....	89
Genenc 3D Drafting.....	199
Genenc Cadd Level 2 Starter Kit.....	89
Genenc Cadd 5.0.....	279
Harvard Graphics.....	Call
PC Paintbrush IV Plus.....	109
Perspective Jr.....	69
First Choice.....	95

PC Tools \$99 Deluxe 7.0

New PC Tools 7.0 is the perfect set of utilities for DOS 5. Includes new application menu system, remote operation of another PC, advanced data recovery and an enhanced Backup in DOS and Windows versions. Anti-Virus, which recognizes over 400 known viruses and even detects unknown ones is included as a free bonus.



INTEGRATED

Framework XE.....	95
Geoworks Ensemble.....	115
LotusWorks.....	89
SmartWare II.....	417
Symphony 2.2.....	489
Works.....	89
Works w/ MS Serial Mouse.....	119
Macro Assembler.....	95

PROGRAMMING

Microsoft C Compiler.....	303
Borland C++.....	299
Borland ObjectVision for Windows.....	89
Turbo Pascal Dos/Windows.....	90/Call
Quick Basic.....	60
Quick C or Quick Pascal.....	60
Visual Basic for Windows.....	125
Windows Developer's Kit.....	309

SPREADSHEETS

Allways.....	115
Excel for Windows.....	299
Lotus 1-2-3 version 2.3.....	325
Lotus 1-2-3 version 3.1+.....	399

Lotus 1-2-3 2.3 \$325

The powerful spreadsheet that runs on any PC. New WYSIWYG display, mouse support, 200 graph types, drawing tools and other graphics features to make spreadsheet publishing a breeze. Release 2.3 also adds auto compress printing, auditor, file viewer, context sensitive help, print preview and more. Call us for upgrade information too!



Lotus Upgrades.....	Call
Quattro Pro 3.0.....	89
Quattro Pro 3.0 Comp. Upgrade.....	89
Supercalc 50.....	89

WORD PROCESSORS

Facelit for WordPerfect.....	57
Grammatik IV.....	55
LetterPerfect.....	119
Multimate 4.0.....	267
Professional Write.....	159
Publisher's PowerPak / WordPerfect.....	call

WordPerfect 5.1 \$239

WordPerfect is the #1 rated word processing software. Its got almost every feature imaginable and yet it's easy to use. The current version adds pull-down menus, mouse support, table creation and equation editor. Add this to the best software support in the business and you can't go wrong!

RightWriter.....	55
Spnt.....	117
Word.....	209
Word Perfect 5.1.....	239
Word Perfect for Windows.....	269
Word Perfect Add'l Station.....	159
Word Perfect Office.....	89
WordStar Professional.....	Call
Writer's Toolkit.....	79

UTILITIES

386 MAX.....	59
Address Book Plus.....	45
Calendar Creator Plus.....	39
Central Point Backup.....	79
Checkit.....	79
Company Ladder.....	45
Control Room.....	69

MS-DOS 5.0 \$55

The new Microsoft DOS 5.0 frees 45K or more for DOS on 286 & 386 PCs. It includes a new Shell, Undelete and Unformat, new Editor and more. Also includes Obsolete, Command Line Help, new Backup and Windows enhancements. Plus, you can install it on your drive without reformatting, even on Networks. This official upgrade pack requires that you simply have an older command.com on your drive!

Line Help, new Backup and Windows enhancements. Plus, you can install it on your drive without reformatting, even on Networks. This official upgrade pack requires that you simply have an older command.com on your drive!

CoreFast.....	60
Carbon Copy Plus.....	105
Desqview.....	75
Desqview 386.....	125
Direct Access.....	57
Disk Manager Dos / Novell.....	36 / 95
Disk Optimizer.....	37
DR DOS 5.0.....	Call
GScript 3.0.....	89
Fastback Plus.....	109
Headroom.....	59
Hulaak 2.0.....	95
InfoSpotter.....	45
Labels Unlimited.....	45
Laplank III.....	85
Mace Utilities 1990.....	88
Microsoft Learning DOS.....	32
MS-DOS 5.0 Upgrade.....	55
Norton AntiVirus.....	79
Norton Backup.....	90
Norton Commander.....	90
Norton Utilities 6.0.....	109

Stacker \$79

Stacker doubles the capacity of your hard disk in minutes, without reformatting. It compresses files in the back-ground transparently giving you the extra room you need. For higher performance, Stacker soft-ware with compressor card (\$139) is an easily installable hardware solution which gives your hard disk a new lease on life.



PC Anywhere IV.....	95
PC Tools Deluxe 7.0.....	99
Personal Lawyer.....	34
P D Queue.....	55
PFS:Preface.....	47
Pop Drop Plus.....	53
PrintRite.....	55
ProComm Plus.....	65
Prodigy.....	25
QA Plus.....	85
OEMM 386.....	59
GRAM.....	47
QuickKick 2.0.....	55
Sideways.....	55
Smartcom Exec.....	69
Super PC Kwik.....	43
Virex-PC.....	75
XTree Gold 2.0.....	89

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AST Premium Exec 286 20/40MB	CALL
AST Premium Exec 386 20/40/60MB	CALL
Compaq LTE386 30MB	3599
Compaq SLT386 60MB	CALL
Everex Tempo LX 20/40/60MB	CALL
NEC Ultralite 286F	CALL
Packard Bell PB286NB VGA/20MB	1369
Packard Bell PB386SX VGA/40MB	CALL
Panasonic CF270/370	1789/2999
Sharp PC6220 286 VGA 20MB	SPECIAL
Tandon 386SX 20MHz 60MB	CALL
Texas Instrument TM2000	CALL
Texas Instrument TM3000	CALL
Toshiba T1200XE	1849
Toshiba T2000SX 20MB	2729
Toshiba T3200SX	3199
Toshiba T3200SX 120MB color	5799
Toshiba T5200 100MB	4199
Zenith ALL MODELS	CALL

COMPUTERS

AST Premium II 386SX/20 model 5	1699
AST Premium II 386/33 model 5	2399
AST Premium II 486SX/20 model 5	2499
Compaq Deskpro 386S w/80MB	2149
Compaq Deskpro 386S/20 w/80MB	2299
Compaq Deskpro 386/20E w/124MB	2799
Compaq Deskpro 486/33L mod 320	9229
Compaq SystemPro	ALL MODELS
DTK 286/386/486	custom quotes CALL
Packard Bell all models	CALL
Wise Terminals 30/50/80	294/375/298

DISK DRIVES

Conner CP3044 40MB IDE	229
Conner CP3104 105MB IDE	389
Conner CP3204 210MB IDE	655
Maxtor LX7213A 213MB IDE	789
Microplata 1654-7 161MB ESDI	739
Plus Hardcard II XL 105MB	379
Seagate ST251-1 40MB MFM	565
Seagate ST157A 45MB IDE	242
Seagate ST1102A 89MB IDE	199
Seagate ST1144A 124MB IDE	349
Teac 360K 5.25" floppy	59
Toshiba 1.2MB 5.25" floppy	69
Toshiba 1.44MB 3.5" floppy	69

MATH-CO-PROCESSORS

Cyrix 80387DX-20	189
Cyrix 80387DX-25	189
Cyrix 80387DX-33	199
Intel 80287XL	89
Intel 80387SX-16	129
Intel 80387SX-20	139
Intel 80387SX-20/25/33	205
Weitek	ALL MODELS CALL

MEMORY PRODUCTS

2MB for T1000SX/E & T2000SX	269
2MB for T1200XE	179
1MB for AST Exec	149
2MB for T.I. TM3000	249
1MB for CPO LTE 386SX	319
256K 80ns DRAM	5.50
256K 90ns SIMM	17.00
1MB/9 80ns SIMM	CALL
4MB/9 80ns SIMM	CALL



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PaintShop XLVI	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
PaintShop XLVII	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
PaintShop XLVIII	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
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PaintShop LVI	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
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PaintShop LXIV	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
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PaintShop LXVI	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
PaintShop LXVII	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
PaintShop LXVIII	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
PaintShop LXIX	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
PaintShop LXX	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
PaintShop LXXI	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
PaintShop LXXII	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
PaintShop LXXIII	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
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PaintShop LXXVI	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
PaintShop LXXVII	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
PaintShop LXXVIII	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
PaintShop LXXIX	3.5	499	Statistical Analysis	5.0	659	Statistical Analysis		89	Pacific Page Personal Edition	365	
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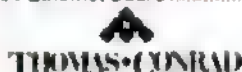
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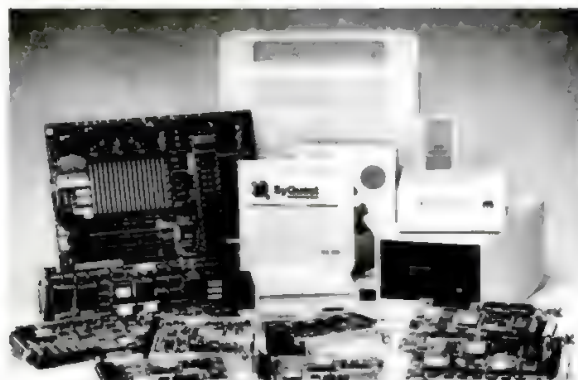
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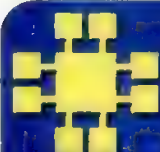
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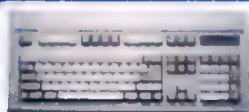


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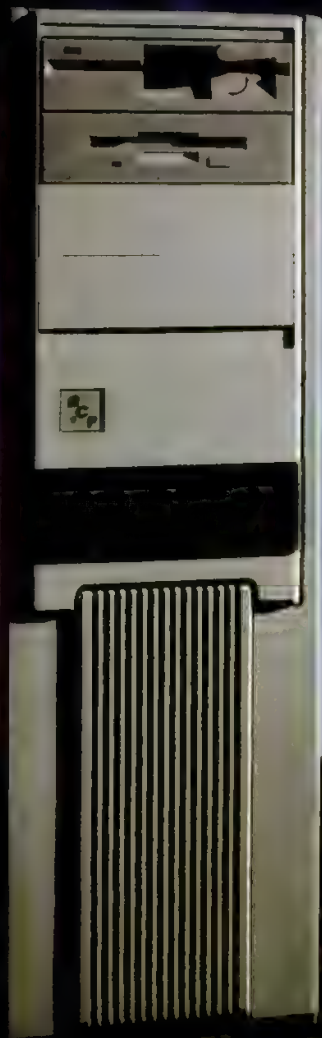
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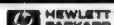
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	4Meg Module	113132-001	225.00
DeskPro 386/20	1Meg Module	113131-001	59.00
	4Meg Module	113132-001	225.00
DeskPro 386S	1Meg Exp Bd	113633-001	129.00
	4Meg Exp Bd	113634-001	309.00
	1Meg Module	113646-001	79.00
	4Meg Module	113647-001	239.00
DeskPro 386/20E	1Meg Exp Bd	113644-001	129.00
DeskPro 386/25E	1Meg Module	113131-001	59.00
	4Meg Module	113132-001	225.00
Compaq SLT/286	1Meg Module	110235-001	129.00
	4Meg Module	110237-001	529.00
Compaq SLT/386	1Meg Module	118303-001	179.00
	2Meg Module	118304-001	359.00
	4Meg Module	118305-001	629.00
Compaq Lite 286	1Meg Bd	117081-001	69.00
	2Meg Bd	117081-002	159.00
	4Meg Bd	117081-004	449.00
Compaq Lite 386S/20	1Meg Module	121125-001	199.00
Compaq Lite 386S/20	2Meg Module	—	319.00
Compaq Lite 386S/20	4Meg Module	—	509.00

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T1200XE	2Meg	PC13-PA8305U	119.00
T1600	2Meg	PC8-PA8302U	119.00
T2000SX, SXC	1Meg	PC14-PA8316U	119.00
	2Meg	PC14-PA8317U	189.00
T2000SX, SXC/T1000LE	4Meg	PC14-PA8314U	450.00
	8Meg	PC14-PA8315U	719.00
T3100E	2Meg	PC9-PA8340U	119.00
T3100SX	2Meg	PC15-PA8308U	119.00
	4Meg	PC15-PA8310U	249.00
T3200	3Meg	PC6-PA7137U	200.00
T3200SX	2Meg	PC12-PA8307U	119.00
	4Meg	PC12-PA8309U	249.00
T3200SXC	2Meg	PC19-PA8318U	129.00
	4Meg	PC19-PA8319U	289.00
T5100	2Meg	PC7-PA8301U	119.00
T5200, 5200C	2Meg	PC10-PA8304U	119.00
	8Meg	PC10-PA8313U	769.00
T8500	2Meg	PC10-PA8304U	119.00
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NEC Prospeed 286, 386SX-16	4Meg	PC21-22	505.00
NEC Prospeed 386	2Meg	PC31-21	179.00
NEC Prospeed 386	8Meg	PC31-22	849.00
NEC Prospeed 386SX-20	1Meg	PC43-21	169.00
NEC Prospeed 386SX-20	4Meg	PC43-22	539.00
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TI Travelmate 2000	1Meg	2568034-0001	149.00
TI Travelmate 3000	2Meg	2568996-1	139.00
Zenith Super Sport — 286, 286E	1Meg	ZA-180-66	125.00
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SX Alpha	2Meg	ZA-180-66	199.00
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AST Notebook Prem Exec	4Meg	500814-003, 386SX20	399.00
Sanyo 1715 NB	2Meg	MBC-NBAMEM2	199.00
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IBM P/52 LX40	2Meg	—	179.00, 399.00, 619.00
Epson NB33	1Meg, 4Meg	—	129.00, 349.00

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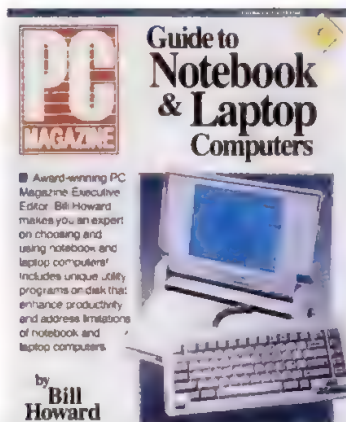
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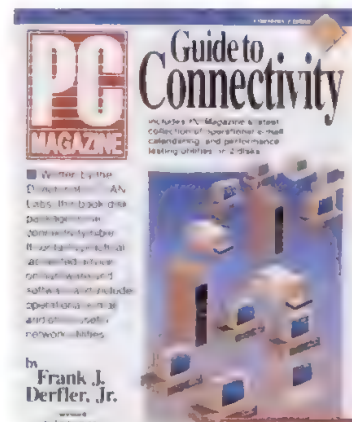


Both a reference and tutorial, this no-nonsense guide from The LeBlond Group helps you get the most from the latest version of Quattro Pro. It includes instruction on managing spreadsheet files and databases, creating graphs and macros, programming, networking, and more.



PC Magazine executive editor Bill Howard has written the definitive guide to choosing and using notebook and laptop computers. Packed with helpful advice on all aspects of laptop use, plus software tips.

◆ Includes one 3 1/2" disk with utilities that enhance productivity and address the limitations of laptops.



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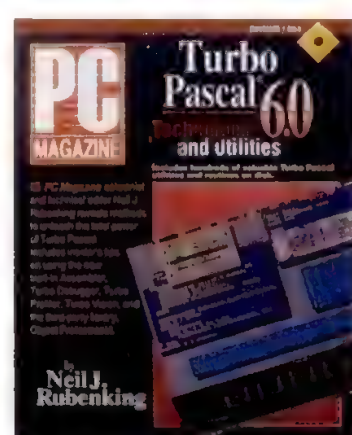
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CIRCLE 494 ON READER SERVICE CARD

by
Joe Salemi

Advisor

Help for Readers Making Personal Computer Decisions

FIXING SECTOR ERRORS

When I try to boot certain programs from my hard disk, I get a "Sector not found error reading Drive C" message. If I hit "Retry" enough times, the boot will eventually continue. What causes this irritating quirk? It only happens with a couple of programs, but the problem persists, even after reformatting with *SpinRite II*.

SpinRite also sometimes informs me that I have disk problems in my file allocation tables I and II. Could that be the problem?

Ed Morris

Amarillo, Texas



Before you do anything else, make sure you have a good backup of the data on your hard disk! The problems you're having are an indication of a failure of some part of the hard disk system.

The hard disk system in a PC consists of two parts: the actual mechanical pieces (the motors that turn the platters and move the heads) and the electronics.

For the hard disk to function properly, both parts have to be working in sync.

A low-level format not only prepares the hard disk for the operating system's format, it also serves to align the mechanical parts with the electronic controller. Once the low-level format is done, the controller knows exactly where to place the heads to read the data you're requesting.

The mechanical parts wear out over time, and with that wear, the controller and the disk drive drift out of alignment. Products like *SpinRite II* (Gibson Research Corp., Laguna Hills, CA 92653; 800-736-0637, 714-830-2200; \$90) test the hard disk, and can perform both a complete low-level format, erasing all the data on your disk, and an on-the-fly format, saving and restoring the data as they go along.

■ **FIXING SECTOR ERRORS:** What does it mean when your hard disk gives "Sector not found" errors?

■ **FINDING SUPPORT FOR PFS PROGRAMS:** Where to go with questions about the PFS series of applications.

■ **WHICH MACHINES CAN RUN IBM OS/2 EE:** Is the Extended Edition IBM-specific?

■ **FAST TEXT RETRIEVAL:** Programs to retrieve text from your hard disk.

■ **A SIMPLE ACCOUNTING PROGRAM WITH BIG ASPIRATIONS:** Accounting software that can handle millions of accounts.

The general consensus is that to correct this drift, a hard disk should have a low-level format done at least once every six months to a year, depending on how heavily it's used.

Since you've already taken that step and the problem persists, we have to look elsewhere. The most likely cause is in the electronics themselves; the controller card is going bad and is not able to maintain the alignment with the disk. This can be caused by excessive heat build-up inside the machine, or it can be caused by failure of one or more of the chips on the card. Whatever the reason, the safest course of action is to back up your data, replace the controller, and low-level-format the hard disk to get it in sync with the new card.

FINDING SUPPORT FOR PFS PROGRAMS

I wonder if you can help me. I am writing this letter using *PFS:First Choice*, Version 3.0. This integrated software package's rights used to be owned by Software Publishing Corp., but apparently the rights have been sold, and I

don't know to whom.

Do you know where I can contact the new owners of the *First Choice* rights, or if SPC is still supporting *First Choice*?

Evan Perkins

Springfield, Missouri



The rights to the entire *PFS* line—including *First Choice*, *Business Gallery*, *First Graphics*, and *First Publisher*—were sold by SPC to Spinnaker Software Corp., Cambridge, MA 02139.

You can call 800-826-0706 or 617-494-1200 for product information and support.

WHICH MACHINES CAN RUN IBM OS/2 EE

I make my living developing applications for large IBM mainframe systems. There is a growing body of software packages that make it possible to use PCs to design these applications. Most of these are described with the acronym CASE (computer-aided software engineering).

The vendors who market CASE packages are generally ignoring *Windows* and proceeding

directly to OS/2. Moreover, they are following IBM's lead and using OS/2 Extended Edition. This brings me to my problem.

Are we locked into IBM hardware if we use software that is written to the special features of OS/2 EE? Are there any compatibles that can run OS/2 EE as it comes from IBM?

William Simmons

Nashville, Tennessee



OS/2 Standard Edition is the base operating system, consisting primarily of the multitasking kernel and Presentation Manager. IBM's version of OS/2 SE is virtually the same as those available from OEMs who have licensed it from Microsoft (though at the time of this writing, IBM's version is 1.3, and most non-IBM vendors are still shipping 1.21).

The Extended Edition version is sold only by IBM. In addition to all the core software in the Standard Edition, EE adds the Database Manager (a SQL database engine), Communications Manager (for async communications and 3270 terminal emulation), and the programs needed to access IBM LAN Server systems. However, these products are nothing more than OS/2 applications and are installed separately from the base operating system.

Beginning with the release of OS/2 1.2, IBM began a program certifying non-IBM machines as being capable of running OS/2 EE. Among the many vendors whose machines are certified are AST, Compaq, Dell, Northgate, and Zenith, and the list is growing. IBM has also stated that with the release of OS/2 2.0 (the 32-bit 80386-or-better version), IBM will be unbundling the applications that comprise the Extended Edition and will be selling them as separate products for any OS/2-based system. OS/2 2.0 is

Advisor

due in the fall of this year (and may be out by the time you read this). This will help ensure that the extensions will run on any system capable of running OS/2.

I've installed OS/2 EE on a number of non-IBM systems and have found that if the system can run SE, it can run EE with little or no problem. Other than the Communications Manager needing a 3270 emulation card that is compatible with IBM's own 3270 card, I've found nothing in EE that is specific to IBM machines. I suggest, however, that you test the systems you wish to purchase first to be sure that they run IBM's version of OS/2, or get written certification from the vendors that their systems will support OS/2, before you buy them.

FAST TEXT RETRIEVAL

We are looking for a text-retrieval software package with a fast search and display response that we can use to work on large ASCII files.

At present we are using a package called *Friendly Finder*, Version 4.0, by Proximity Technology. This software, although meeting our present needs, will get slower when the volume of our data files grows larger.

We would appreciate it if you could tell us of similar packages and their suppliers.

F. Abdilla
Dingli, Malta



There are a number of text-searching utilities available, but with your requirements, the best type to get is one that builds an index to speed up the searches.

There are two utilities that do this: *ZyIndex* (ZyLAB Corp., Buffalo Grove, IL 60089; 800-544-6339, 708-459-8000) and *Magellan* (Lotus Development Corp., Cambridge, MA 02142; 617-577-8500).

ZyIndex Professional (\$295) and *ZyIndex Plus* (\$495) will index and search text and word processing files on hard and floppy disks, CD-ROM drives, network drives, or other removable media.

You can do the searches using wildcards, Boolean logic, or proximity (how close two particular words or phrases are to each other within a document). When *ZyIndex* finds the text, it displays it on-screen, letting you cut and paste the info into another document. Support for over 25 word processing packages is included, so you're not limited to ASCII text. The *Plus* version adds support for nested searches.

ZyIndex was discussed in the sidebar "Building Your Own PIM" in the November 27, 1990, review "Order from Chaos: PIMs Tackle Your Desktop."

For complete text-searching abilities, as well as hard disk management and application program control, you can't beat *Magellan* (\$139). In addition to ASCII text and word processing files, *Magellan* can search for a



DacEasy is designed to help nonaccountants manage businesses, but it allows you to number accounts up to 16 digits.

word or phrase in a number of spreadsheet and database file formats. When the text is found, the document is displayed on-screen, so you can see the words in their proper context and properly formatted, in most cases.

You can search by using Boolean logic, wildcards, and "fuzzy logic" (used to find similar words or phrases instead of exact hits). *Magellan* will indicate the "match percent," showing how close it thinks a particular document is to what you're searching for.

Like *ZyIndex*, it will let you cut and paste the information found into a new document. However, *Magellan* adds the ability to create a macro for searches (or other functions), so you don't constantly have to re-enter your common search commands. The macros can be compiled into a menu, making it easy to select predefined searches. *Magellan* can also launch the particular application package associated with the file you're viewing, and load the file.

And you can view some graphics formats, like .PCX and TIFF, although the quality is often less than you would desire.

Finally, *Magellan* includes a number of functions that allow you to manipulate and control the files on your disk. Lotus adds new and improved file viewers from time to time, which are available either direct from Lotus or through its support forum on CompuServe.

A SIMPLE ACCOUNTING PROGRAM WITH BIG ASPIRATIONS

Please advise me on a simple accounting program that runs on an 8088-based 640K PC and allows account identification to be 16 or more digits. The program is to run on a single-user PC, and sophisticated modules and options are not required.

Christian Blohm
Miami, Florida

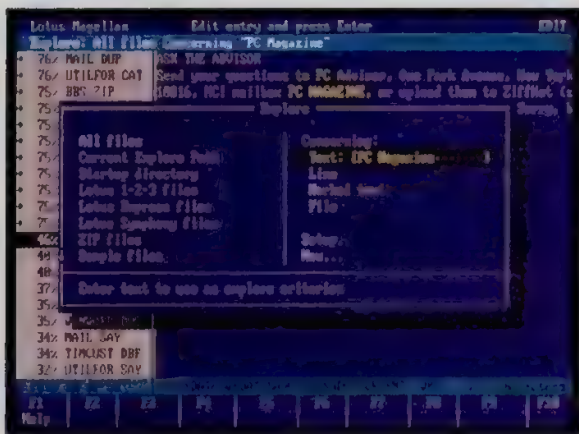


There are a number of accounting programs designed for the home or small-business user, and an increasing number of them run under Windows. But I could find only one program that allows account IDs larger than 16 digits. *DacEasy Accounting*, Version 4.1 (DacEasy Inc., Dallas, TX 75252; 800-877-8088, 214-248-0205; \$150) provides for up to 30 alphanumeric characters in the identification field.

DacEasy tightly integrates the General Ledger, Accounts Receivable, and Accounts Payable modules with support for inventory control, billing, and forecasting.

ASK THE ADVISOR

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Magellan lets you search all the files on your disk or a select set of files for a word or phrase.

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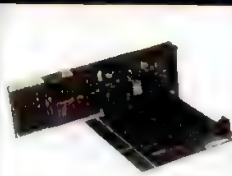
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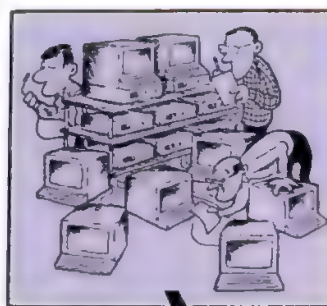
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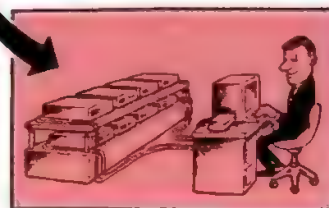
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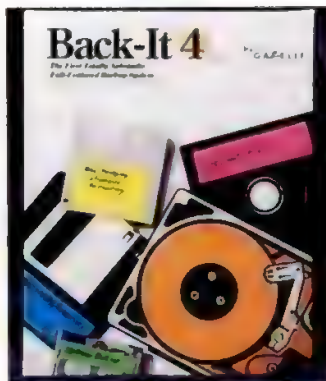
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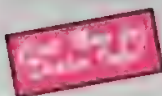
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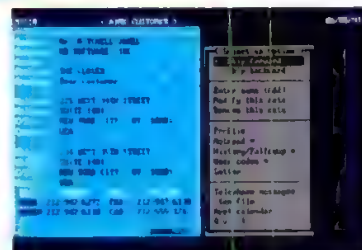
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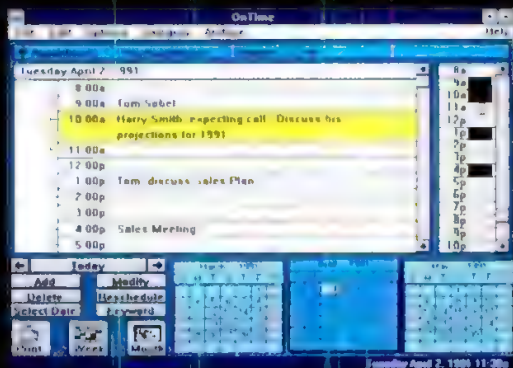
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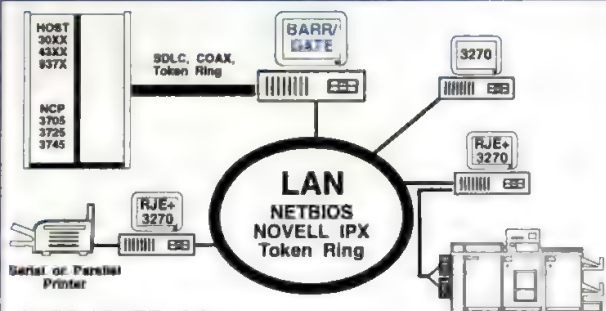
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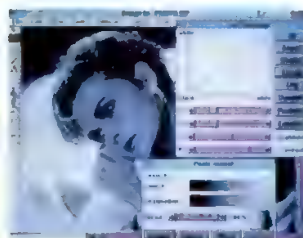


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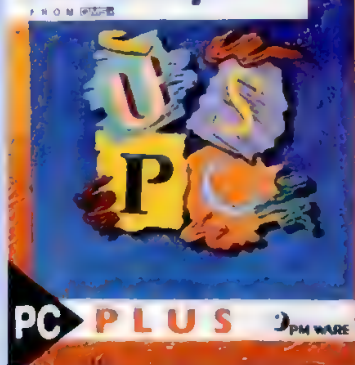
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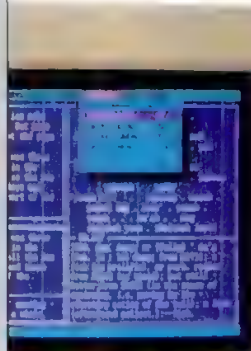
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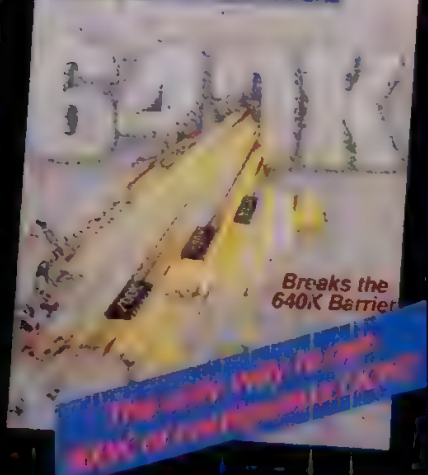
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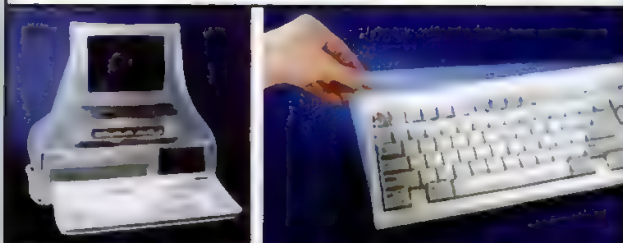
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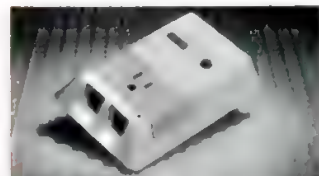
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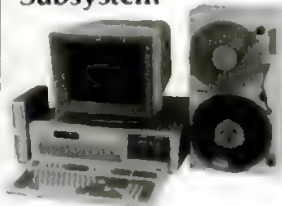
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On Page 27.

No 8

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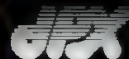
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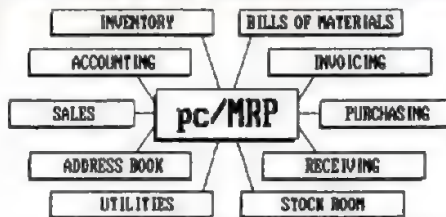
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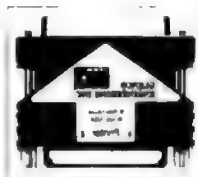
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■ ANTI-VIRUS SOFTWARE



DISK KILLER

The threat of virus attacks on your PC is real and growing, but a little common sense and the watchful eye of an anti-virus program can go a long way toward keeping your computing safe. PC Magazine Labs tests 24 anti-virus software solutions to find the programs that best protect your data.

■ 10BaseT CONCENTRATORS

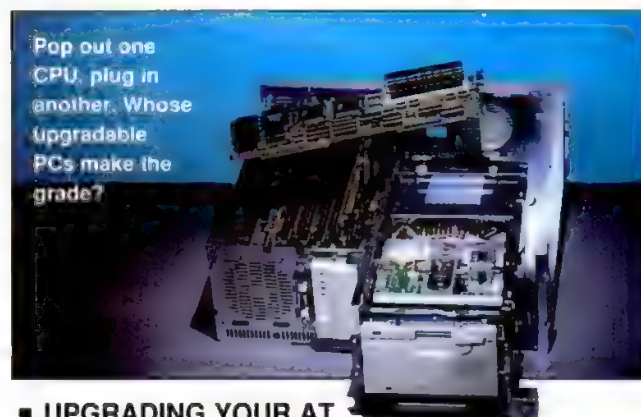
In this issue, we look at 10BaseT concentrators and hubs from companies like Artisoft, AT&T, BICC Communications, Cabletron, David Systems, Hewlett-Packard, and Synoptics, among others. These products are necessary elements in a 10BaseT network. And there's more than just hardware—they also include proprietary management software to ease the administrator's troubleshooting and tracking activities.

■ CD-ROM DRIVES

As the multimedia wave begins to build, *PC Magazine* takes a look at 14 CD-ROM drives—all capable of transferring data at 150K per second. You'll also get our list of the top 22 CD-ROM titles: From atlases to history to writers' aids, check out the most useful and interesting multimedia applications available today.

■ UPGRADABLE PCs

Upgradable PCs are flooding the market, with vendors combining one motherboard and interchangeable 386SX, 386, and 486 processors. In most cases, you won't sacrifice performance, but you might never use the upgrade. So who benefits from this flexibility: your dealer, your purchasing department, or you? PC Labs tests systems from ALR, Amkly, AST, Copam, Dell, Everex, Reply, and Tandon.



■ UPGRADING YOUR AT

A new generation of microprocessor upgrade adapters will turn your 286 into a 386SX in one easy process. PC Labs tests five such cards, from Aox Technologies, Cumulus, Intel, Kingston Technologies, and MicroWay, to determine whether they'll save you time or money, or whether it makes more sense to bury that old AT.

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Products for the Leisure Side of Personal Computing

Carmen Sandiego And Her New Gang Wreak Havoc with America's Past

EDUCATION
by Carol Ellison

If Broderbund ever reformats its inventory of Carmen Sandiego disks, declares the heroine dead, and puts its marketing muscle behind a new PC hero, super-market tabloids will continue to report Carmen sightings in the most unlikely places. Like Elvis, Carmen has become larger than life. She has transcended her original modest role as a mere game character and become a phenomenon among computer kids of all ages.

Where in America's Past is Carmen Sandiego?, the fifth and latest release in the award-winning software series, offers complexities of plot and graphics that make the original *Where In The World Is Carmen Sandiego?* seem almost bland by comparison.

With 45 geographical destinations and 9 historical periods

in which to alight, Carmen's possibilities for escape in this game far outnumber those in *Where in the World*. Among other times and places, Carmen and her henchmen turn up at the signing of the Declaration of Independence, Secretariat's Kentucky Derby victory, and Stephen Austin's settlement in Texas. The 32-color VGA "location graphics" paint crime scenes that are much more vivid and interesting than those found in most of the previous Carmen editions.

The graphics also include scanned art from some notable sources, including the Vose Galleries of Boston, the Museum of the City of New York, the Virginia Historical Society, NASA, and the U.S. Military Academy. The game auto-detects the player's video card and installs itself for the appropriate graphics standard.

Where in America's Past

won't disappoint adventure-hungry Carmen fans. As entertainment, the game is fun and challenging. As education, it surpasses the other history game in the Carmen series, *Where in Time is Carmen Sandiego?*

While *Where in Time* simply challenges a player to look up and recall historical facts, *Where in America's Past* develops a true historical context for places and events as it covers more than 400 years of American history.

Players select their destinations from a time line and a time-sensitive map, which changes appropriately when players select different eras. The map highlights only those states that were part of the country during a selected era, for example.

The game theme is familiar. One of Carmen's gang makes off with some sort of American treasure and disappears through time. It's your job to track down the loot using the Chronoskimmer 450SL time-travel machine and to return the loot to its rightful home in history. Along the way you interview witnesses, gather clues to the henchman's identity, secure a warrant, and make an arrest before you exhaust your allotted time.

Nancy, the churlish secretary at the Acme Detective Agency, greets new players, signs them in, and sends them to see the "Chief" and his dog, Stretch. The Chief proves to be of little additional assistance, but Stretch reappears throughout the game to sniff out the villains and assist you with arrests. With each arrest you work your way toward a promotion as you climb a career ladder from Tenderfoot to SuperScout. Solve 80 cases and you're inducted into the Hall of Fame.

The game's villains have poetic identities. Homer De-Brave is a retired slow-pitch softball player gone bad. And Claire Voyant, a former tabloid

EDUCATION

Carmen Sandiego is back, and she's up to her old tricks.

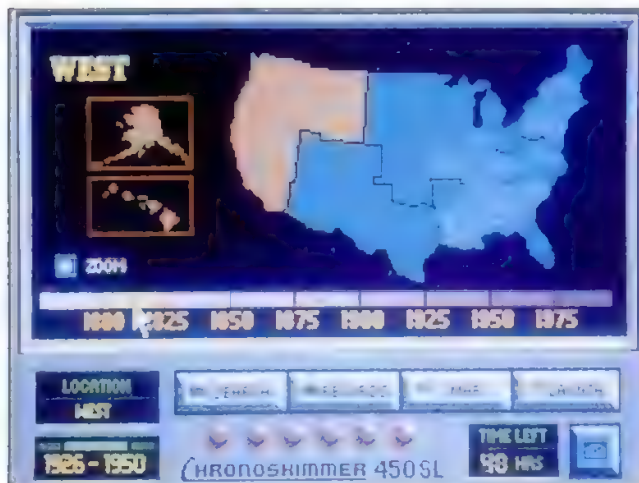
LANGUAGE

At a loss for that perfect riposte? Try Quotemaster.

GAMES

Lemmings, an arcade game for team players.

Super Fly: Take a swat at it.



The latest installment in the Carmen Sandiego series employs a map that is sensitive to time contexts.

psychic, was hired by Carmen to read gang members' palms and predict what fortunes lives of crimes portend. A user's guide, printed in the style of a turn-of-the-century newspaper, gives us some curious insights into history, such as the theory that the Liberty Bell was cracked in 1982 when Carmen's henchmen dropped it during a heist.

Like its predecessors, the game comes with its own reference book. This one is *What Happened When*, an edition of the *Encyclopedia of American Facts & Dates* that's abridged but spans 1,460 pages nevertheless. The book's exceptional index seems almost superfluous since events are arranged chronologically. You'll appreciate the encyclopedia's easy-to-read layout since the program is protected by off-disk copy protection that requires you to look up and enter data from the book to gain entrance to the game. Once you begin playing, you must also find information in the book in order to reach higher levels.

The richness of Carmen's latest adventure involves a trade-

CONTINUES

After Hours

Carmen Sandiego

CONTINUED

off in terms of disk space. *America's Past* is delivered on six floppy disks, compared with the two disks that neatly contained the original, and the new version must be installed on a hard disk.

If *Leisure Suit Larry* was the first swinging single to emerge from the PC game world and find mass popularity, then Carmen Sandiego is certainly gamedom's most famous time-traveling thief. But Carmen has the additional virtue of providing an educational experience in addition to a genuinely amusing good time.

List Price: *Where in America's Past is Carmen Sandiego?*, \$59.95. **Requires:** 640K RAM for VGA version; 512K to run Tandy, EGA, CGA, or Hercules version; hard disk; DOS 2.11 or later; mouse. Broderbund Software Inc., 17 Paul Dr., San Rafael, CA 94903; 415-492-3137.

CIRCLE #14 ON READER SERVICE CARD

CARMEN SANDIEGO... SUPERSTAR

Carmen Sandiego has always moved around, but now her career is really *going places*. The overwhelming success of Broderbund's software has led the company to license this highly appealing character to a number of other mass-media outlets. To put it mildly, Carmen is about to become ubiquitous.

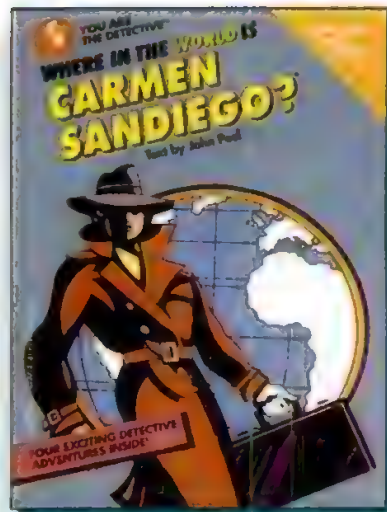
As we went to press, Western Publishing was planning a September debut for a series of four books based on Carmen's travels with her dastardly henchmen. The self-contained books will cost a very reasonable \$2.95 and allow youngsters to track Carmen down without need for the original software or the reference books that come with the original programs.

While the book titles are drawn from the original software, author John Peel has cooked up 16 new cases—4 per book—that challenge the

reader's powers of deductive reasoning. A set of colorful insert cards comes with each book; the cards are crucial to solving each case. Players can keep score as they pursue their quarry.

Carmen must have one heck of an agent, because her blossoming stardom will also take her onto the TV airwaves in September. PBS affiliates will begin broadcasting "Where in the World Is Carmen Sandiego," a kid-oriented game show that also takes Carmen's life of peripatetic crime as its theme.

Nintendo junkies will soon get to match wits with the master thief. Konami has developed a version of *Where in Time* to run on Nintendo's home video-game system, and Broderbund reports that the



Western Publishing plans an entire series of interactive books that will bring Carmen's escapes to a potentially huge audience.

cartridge is quite similar in look and feel to the original PC version.

And—last but not least—rumors are also flying about a possible movie deal. Now all she needs is a multimillion-dollar recording contract, and Carmen will unseat Madonna as the multimedia sensation of the decade.

—Jonathan Matzkin

Quote Database Puts Wit And Wisdom on a Range of Topics at Your Fingertips

EDUCATION
by Barry Simon

"If you put tomfoolery into a computer, nothing comes out but tomfoolery. But this tomfoolery, having passed through a very expensive machine, is somehow ennobled, and no one dares criticize it."—Pierre Gallois

Writers have long known that an apt quote can enliven their work. *Bartlett's* and other compendia of quotes are standard parts of a writer's bookshelf. Just as we have computer dictionaries, thesauruses, and atlases, so too, we have *Quotemaster* from PennComp, which makes your PC a veritable font of pithy wit. There are two PC versions: The DOS-based *Quotemaster Plus* for DOS and *Quotemaster Plus*

for Windows, a *ToolBook* application. Each costs \$89 and comes with a primary quotebase of over 3,000 quotations.

There are four additional quotebases, each with over 500 quotes, organized into four categories: humor, success, contemporary, and motivational.

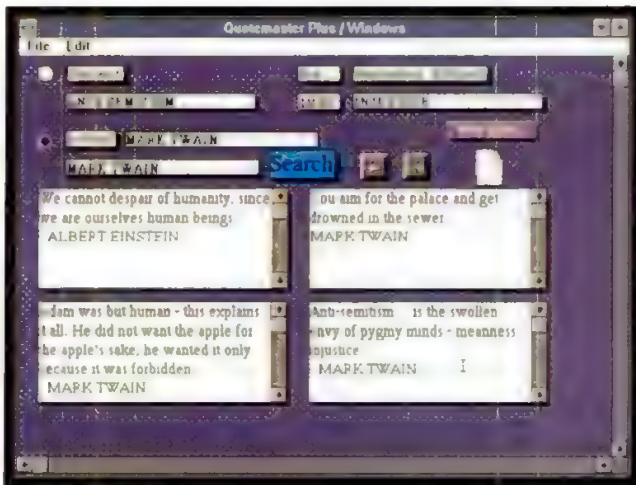
When you install the extra quotebases, *Quotemaster Plus* merges them into one large database. You can add additional quotes with either program, and both versions let you search for all of the quotes from a particular author or on a particular subject. You can also specify a time period as a search criterion. But unfortunately there is no system of searchable keywords other than the primary subject. In the DOS version—but not in the current Windows version—

you can search on words in the quotes, but the search is not really word-specific. Searching on the word *end* matches quotes with the word *friend* or even quotes by Oliver Wendell Holmes.

Once you find the quote you

want, the Windows version lets you easily cut the quote to the clipboard and paste it into a document from there. In the DOS version, you can output a quote to an ASCII file.

The user interfaces are awkward. CONTINUES



Quotemaster collects thousands of profound observations that you can use to perk up your writing.

After Hours

Quotemaster

CONTINUED

ward. When you fill out the search template in the DOS version, for example, there is no way to go back to the first field (subject) once you've passed it. In the Windows version, the list boxes of authors or subjects do not scroll to the first entry starting with a particular letter when you tap the corresponding letter key. Still, the interfaces are usable, the searches are speedy, and the quality of the quotebase—the reason you should purchase something like this, after all—is superb. One of the great things about the quotebase is the pleasure of finding gems while browsing, so I'll end with

one that tickled my fancy:

"An idealist is one who, on noticing that a rose smells better than a cabbage, concludes that it will also make a better soup."—H.L. Mencken

List Price: *Quotemaster Plus* for DOS and *Quotemaster Plus* for Windows, \$89 each. Additional quotebases are \$25 each, or \$169 for the program, primary quotebase, and all four additional quotebases.

Requires: For DOS version, 512K RAM, 2.7MB to 5.6MB hard disk space, DOS 2.1 or later. For Windows version, 3.2MB to 5.7MB hard disk space, Windows 3.0. PennComp, 4031 Villanova St., Houston, TX 77005; 800-326-6145, 713-669-0965.

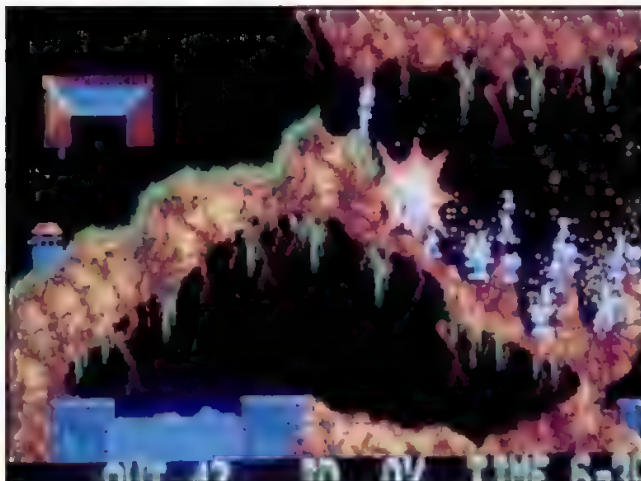
CIRCLE 615 ON READER SERVICE CARD

Make Friends and Influence Rodents: Lemmings Puts You in Charge of a Herd



They may not possess the intellect of Albert Einstein, but give them 15 minutes of your time and lemmings will wreak havoc with your productivity and your sanity. These hapless rodents are cute, docile, and addictive. Once you start playing *Lemmings* (\$49.99 from Psygnosis), you'll have trouble stopping.

In this challenging arcade game, you are the all-seeing, all-powerful *UberLemming*—the only creature with enough sense and foresight to save the species from immediate extinction. The basic action of the game is pretty simple; lemmings drop one at a time through a trap door onto two-dimensional terrain. As the brains of the species, it's up to you to keep them alive. You must assess the situation quickly and



As the all-powerful *UberLemming*, you must sometimes sacrifice a furry hero or two for the good of the herd.



As you guide your conformist critters through the 120 levels in *Lemmings*, you will encounter a variety of obstacles.

assign skills to the conformist critters to prevent them from taking a long walk off a short cliff or a short walk into a fiery furnace.

You can make them dig, float, climb, build bridges, block the progress of the herd or even explode. The goal is to strive for the greater good of the species.

The cartoon-like appeal of the animated lemmings combines with the rigorous demands of 120 different levels of play to make *Lemmings* a unique arcade challenge. Each level offers an increasingly difficult set of obstacles for the lemmings to overcome and a different number of skills you can assign.

Before you attack a level, you are assigned a percentage of the lemming population to save, and are told how much time you have to save them. Overstep your time limit or let a few too many lemmings slip over the edge, and you'll have to repeat the level. Once you complete a level, you receive a password for the next, so you can return directly to the level of your choice. According to Psygnosis, these passwords are quantitative: They measure how many tries it took you to solve a particular level and how many lemmings you actually saved.

You can manipulate the rodents easily by using their computer relative, the mouse, or (with a bit more practice) the keyboard. Using the mouse, everything from choosing a level of play to assigning skills is a simple point-and-click operation. If you choose to rule the lemming king-

dom by keyboard, you'll have to remember which letter keys control which movements and learn to use them carefully. It's easy to scroll completely off the playing field with just a few extra key strokes.

Whichever mode of play you choose, you'll be hard-pressed to keep your mind on your task. The VGA graphics, well-timed sound effects, and 21 familiar *Lemmings* tunes (available if you install a sound card) are so amusing and expressive that it's easy to become engrossed in the show and forget to stop the death march. Should you get confused, though, you can click on the clever little paw print icon to pause the action or choose the irresponsible way out: Nuke the level and start over.

You're a hard-hearted player, indeed, if you can nuke an entire level of lemmings without a pang of remorse or if you can shut down the game without trying to solve just one more level. There always seems to be another challenge ahead and more lemmings to keep alive. Because its emphasis is on problem solving and patience rather than a quick trigger finger and mass carnage, *Lemmings* may be one of the healthiest addictions around.

List Price: *Lemmings*, \$49.99.

Requires: 512K RAM, DOS 2.11 or later; mouse highly recommended, AdLib or Sound Blaster optional, joystick optional. Psygnosis N.A., 29 St. Mary's Ct., Brookline, MA 02146; 617-731-3553.

CIRCLE 616 ON READER SERVICE CARD

After Hours

Super Fly: Clean House Armed Only with a Swatter

GAMES
by Barry Simon

Nels Anderson has proven once again that shareware games can be as creative and entertaining as their conventionally marketed counterparts. *Super Fly*, a \$15 shareware title, offers the combination of impressive graphics and intelligent design that marks his earlier *Trek* and *Shooting Gallery* games (see *After Hours*, November 27, 1990).

The basic setup of the game is simple, if a little farfetched. You are in a fly-infested house, and you are armed with three swatters. You can move a swatter in the four rectilinear directions using the cursor keys, a mouse, or a joystick. If you swat

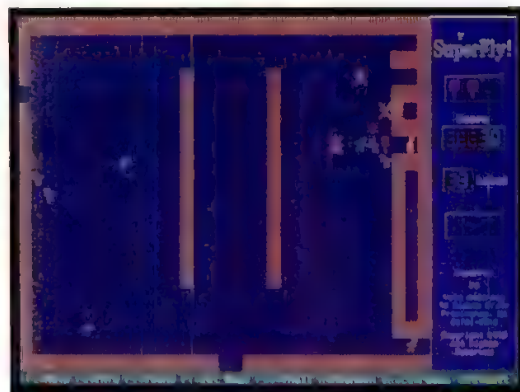
a fly, the fly dies; more flies enter as you kill off their predecessors. The live flies move and are attracted to you, and the dead bodies of swatted flies inconveniently block your way.

In each of the game's 20 rounds, a "super fly" eventually enters. Swat it and you advance to the next round. While you are awarded points for kills, clearly the real goal is to survive all 20 rounds.

As you work your way through the game, you encounter obstacles that limit your mobility. These include walls and partitions, as well as web-spinning spiders that can block your way.

Super Fly fascinatingly mixes arcade action with strategic

In round 13 of *Super Fly*, you can use a can of Raid to zap the bugs instead of relying on your trusty swatter.



maneuvering. To a certain extent, *Super Fly* is really two games, because it plays differently with the keyboard than it does with the mouse or a joystick. Strategy predominates when the keyboard is used, while a mouse or joystick gives the game more of a rapid-fire arcade flavor.

This game is not easy. I never won, although my seven-year-old son did several times. It may sound warped to say that a game in which you just sit there and kill flies is fun, but fun it is. The

only negative thing to say about *Super Fly* is that it is so habit-forming you'd better not start playing if you have anything else to do.

List Price: *Super Fly*, Release 1.1, \$15 plus \$2 shipping and handling. **Requires:** 256K RAM, EGA or VGA graphics, DOS 2.0 or later; mouse or joystick optional. Nels Anderson, 92 Bishop Dr., Framingham, MA 01701-6540; available on PC MagNet.

CIRCLE 617 ON READER SERVICE CARD

MOVING?

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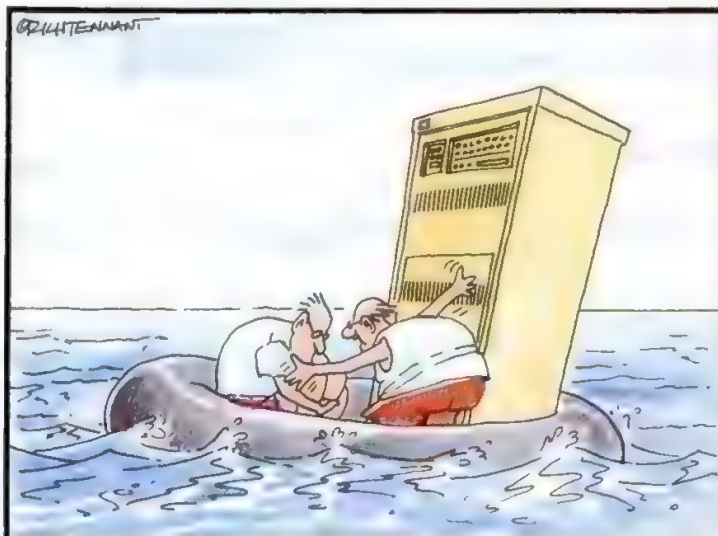
Abort, Retry, Fail?

The Lighter Side of Personal Computing

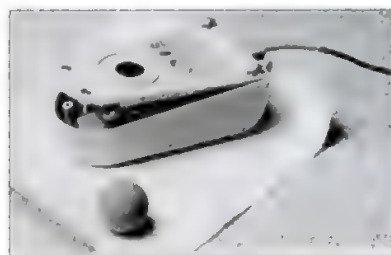
Howzat Again?

"The Carrier [Everex modem] doesn't match the home office capabilities of the similarly priced Satisfaction board from Intel. And WorldPort's 2496 Fax-Maker, though a bit more expensive, is both smaller and cheaper."

—PC/Computing,
April 1991



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"Apple alleges that Windows' graphical command system borrows heavily from the Macintosh system. One example: To delete an unwanted file on both systems, you simply move the file to the 'trash can' icon."

—The Wall Street
Journal,
May 20, 1991

"WordPerfect offers its word processing hardware in 81 countries and 18 languages."

—Calgary Herald, May 21, 1991

If your entry is used in Abort, Retry, Fail? we'll send you \$50 and a PC Magazine T-shirt. Caution: In case of multiple entries, the postmark date, neatness, and completeness of each entry are considered. Winners this issue: Paul E. Woodard (Windows trash can), Charles Tuckey (WordPerfect hardware), Steven Sintering (Carrier modem), John Lester (mouse cleaner), Ian Allan (laser sintering).



Photo 1: Selective laser sintering, a 3-D printing process, starts with a surface model of the object to be made. The laser then "welds" together particles of plastic powder to form the object. In this case, a single gear.

Magic Transformation

Byte magazine (May 1991) says this PC-driven 3-D selective laser sintering (fusing) process can turn plastic powder into "a finished object—in this case, a gear." In this case, what came out looks to us like a brake rotor.

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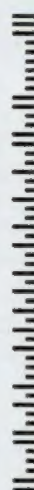


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